Physical Accessibility of Montréal Metro Stations Linked to the Main RÉSO Network

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1. Introduction

Achieving sustainable transportation through the provision of mass transit is a common goal in all urban areas. Despite this notion, current transit infrastructure is designed in a way that users are assumed to be normal and able-bodied which often led to exclusion to those who face difficulties in using the transit (Audirac, 2008; Bromley, Matthews, & Thomas, 2007). In 2001, Canada has around 3.4 million people suffering from various types of disabilities. Statistics Canada (2002) further reported that Quebec ranks next to Ontario with a high disabled population (15 years old and above) at 568,800 individuals. Based on the Participation and Activity Limitation Survey (PALS) (Statistics Canada, 2002), around 135,000 adults with disabilities could not use public transportation services; while 59,000 adults could not travel locally by car and another 179,000 individuals who used public transportation have encountered difficulties. The Table de concertation des aînés de l'île de Montréal (2009) likewise reported more than 101,000 seniors experiencing multiple impairments and that mobility, agility, and pain problems increases in prevalence with age (Statistics Canada, 2004). These impairments often pose serious implications in terms of access to opportunities in the city particularly in using mass transit such as Montréal's Metro.

The Montréal Metro has a long history of development dating back in October 1966 when it was first inaugurated. The underground pedestrian network system was built in 1962 at Place Ville Marie (Boisvert, 2002; Durmisevic, 1999) and its subsequent development was linked to the subway station (Maitland, 1992). In 2004, the downtown segments of the underground city were rebranded and given the name 'RÉSO' which is borrowed from the French word 'réseau' or network. Although the underground pedestrian network is considered private rather than public space (Boisvert, 2002), the network was built as a way to link users to the transit system, act as a refuge during harsh winter/summer seasons, connects to several areas such as shopping malls and a host of other facilities as well as separate pedestrians from car circulation (Barker, 1986; Boivin, 1991; Durmisevic, 1999; Maitland, 1992). The underground space allows Metro users to connect their trip to work, leisure or shopping activities within the RÉSO. Despite several benefits, these networks pose restrictions to users experiencing physical impairments (Hagg & El-Geneidy, 2010) and could lead to exclusion from accessing such amenities.

The overall objective of this paper is to undertake a comparative analysis of the physical barriers to accessibility of the Metro station connected to the RÉSO network. Failure to expand and sustain accessibility options for individuals with physical impairments could be detrimental to their well-being. Overlooking their needs would also lead to discrimination and exclusion from accessing opportunities in cities where they live. Society has a great role in ensuring that mass transit is not only portrayed as part of the urban infrastructure but as a way to ensure inclusivity and accessibility to all users.

2. Accessibility as an Essential Component in Land Use and Transportation Planning

Accessibility is an important characteristic of the geography of space and is frequently included as a goal in transportation and land use planning, and building design. In transportation planning, accessibility is defined as the ease with which activities may be reached and conducted by means of a particular transportation system (El-Geneidy & Levinson, 2006; Iwarsson & Ståhl, 2003; Zhu, Liu, & Yeow, 2006). However from a social point of view, accessibility also entails a person-environment interaction. According to Iwarsson & Ståhl (2003), the concept denotes an encounter between a person's functional capacity and the demands of the physical environment which is supported by norms and standards. In understanding constraints people encounter to the physical environment, Bromley, Matthews, & Thomas (2007) identified two perspectives of disability/impairments. The medical or individual model looks at a person's mental or physical tragedies that inhibit one's normal daily activities. On the other hand, the social model views disability as a result of society's failure to provide a more accessible and user-friendly facilities and improved design. This means that while an individual may have physical disabilities, such as being unable to walk; that same individual also faces disability in accessing a building or transportation facility if there is no provision of ramps, an elevator, among others. As a result of inaccessible facilities, the ease of reaching potential opportunities is hampered. Thus an inappropriate, even erroneous, conceptualization of disability could lead to poor provision of transportation for the disabled (Barrett, Heycock, Hick, & Judge 2003).

Land use and transport planning influences accessibility through the design of the physical environment. In fact, incorporating universal accessibility (or universal design) has become an important consideration in building, landscape design, land use and transport planning (Audirac, 2008; Bromley, Matthews, & Thomas, 2007; Iwarsson & Ståhl, 2003; Project Universal Access, 2010; Societe Logique, 2003). Universal design aims to simplify life for every one of all ages, sizes, and abilities by making the existing and future built environments and products usable by more people. According to AlterGo (1992), having accessible facilities intends to meet the needs of parents with children in carriages or strollers, older adults as well as individuals with reduced mobility. Incorporating the principles of universal accessibility entails enabling all users to reach their destination from a certain pathway system by allowing a significant number of the population to travel independently (Project Universal Access, 2010; Audirac, 2008).

Underground space development is increasingly becoming important in many cities such as Montreal due to challenges in spatial planning of infrastructure and buildings in the downtown area. The International Tunneling and Underground Space Association Committee on Underground Space (ITACUS, 2009) noted that underground space provides new spaces for infrastructure, services and utilities without claiming valuable space on the surface. In countries where urban space on the ground level is limited for development, city authorities, property developers and private investors are taking advantage of developing underground spaces. Durmisevic & Sariyildiz (2001), on the other hand, noted that safety and comfort are among the most important aspects that should be considered in designing underground spaces. AlterGo (2003) further emphasized that incorporating universal accessibility in underground spaces allows for unfettered physical access to buildings or sites and ensures that services are accessible by all users at the same time. Thus the need to eliminate barriers and incorporate universal design practices to the physical environment is an important move to improve accessibility of transit facilities.

3. Accessibility Policies in Montréal and Institutional Coordination

The Master Plan of the City of Montréal (2002) aims to enhance the perception and image of public transportation in order to encourage its use. Public spaces around metro, commuter train and intermodal stations, particularly the waiting areas, warrant special attention to facilitate access and create a safe and pleasant environment that meets the needs of every type of user. Action 14 of the Master Plan further emphasized design principles in the vicinity of public transportation access points particularly in terms of facilitating connections between buses and metro. Implementing universal accessibility policies is one way of promoting social inclusion in the use of public transportation and access to buildings. The United States of America and United Kingdom, for instance, have enacted the Americans with Disabilities Act (ADA) and the Disability Discrimination Act (DDA), respectively, as a basis for incorporating universal design principles in the construction and development of public facilities. In Canada, the cities of Toronto and Winnipeg have already adopted a similar policy. Montreal has yet to come up with a similar universal design policy. The Transportation Plan of Montreal, meanwhile, mentioned universal access as a system-wide concept which is evident through the deployment of articulated or low-floor buses and providing on-demand paratransit services for disabled users. However, the plan has not clearly articulated its design guidelines and how it fits into the overall physical connection of the whole transportation system.

In order to achieve some targets in the Montréal Transportation Plan, the Société de Transport de Montréal (STM) has adopted a corporate policy regarding universal accessibility in order to reduce the number of barriers preventing people with functional impairments from using its public transit network (Société de Transport de Montreal, 2009a). In addition to providing paratransit services (Transport Adapté), STM has recently retrofitted five Métro stations along

the orange line that are now accessible for wheelchair users (Société de Transport de Montreal, 2009b). Bonaventure station on the green line, meanwhile, is partially accessible (i.e. from train platform to terminal). Providing accessible stations along this line connecting to the underground city is still under review and consideration. Despite these developments, much of the efforts are directed towards assisting those who lack personal mobility and are wheelchair-bound. Dealing with this most dire and visible group represents only one segment of the disabled population. Little attention has been paid to the needs of other mobility-impaired groups, including those who are blind or visually impaired as well as individuals with no medical/physical impairments yet still encounter constraints in using the public transit (Marston, Golledge, & Costanzo, 1997).

Institutional coordination also plays an important role in pushing for accessibility improvements. The City of Montréal (2007) has recognized several disability organizations that cater the needs of people with functional impairments such as advocating for the removal barriers to accessibility. Currently, Montréal has six major partners composed of 130 organizations devoted to advancing the concerns of people with disabilities. These organizations lobby to the Ministry of Transport Quebec, the Société de transport de Montréal (STM), Ville de Montréal, among others, so that the concept of universal accessibility is recognized and addressed for persons with disabilities particularly in the light of public transit use.

4. Methodology

An accessibility audit of Montréal's Metro stations connected to the underground city was conducted on 21-28 February 2010. The purpose of the physical audit was to assess the functional accessibility of the train and its infrastructure for selected users with disabilities. The audit has been designed to take account the user's journey from the ground level to using the Metro. In order to generate information in this study, the following steps were undertaken.

4.1. Selection of three types of people with physical constraints in using the Metro as sample units of analysis in the accessibility audit. This research selected wheelchair-bound users, people with visual impairments and users who are able-bodied but experience social/environmental constraints such as women with child strollers as sample units for this study. Statistics Canada (2002) reported that 121,400 people experience visual disabilities, while 418,030 people experienced mobility problems in Quebec (including Montréal). These people with disabilities often face serious problems in accessing public transport. Although statistics for families with young children in Montréal are not readily available, it is assumed that a significant number of these population use the Metro to access different destinations for various purposes.

4.2. Development of an accessibility audit checklist. A simplified checklist was created based on guidelines from the Americans with Disabilities Act (ADA) universal accessibility/design standards (Access Board, 2002; Adaptive Environments Center & Barrier Free

Environments, 1995). The modified checklist was used to audit several facilities of the stations connecting the RÉSO that would assist people who experience difficulties in accessing the Metro.

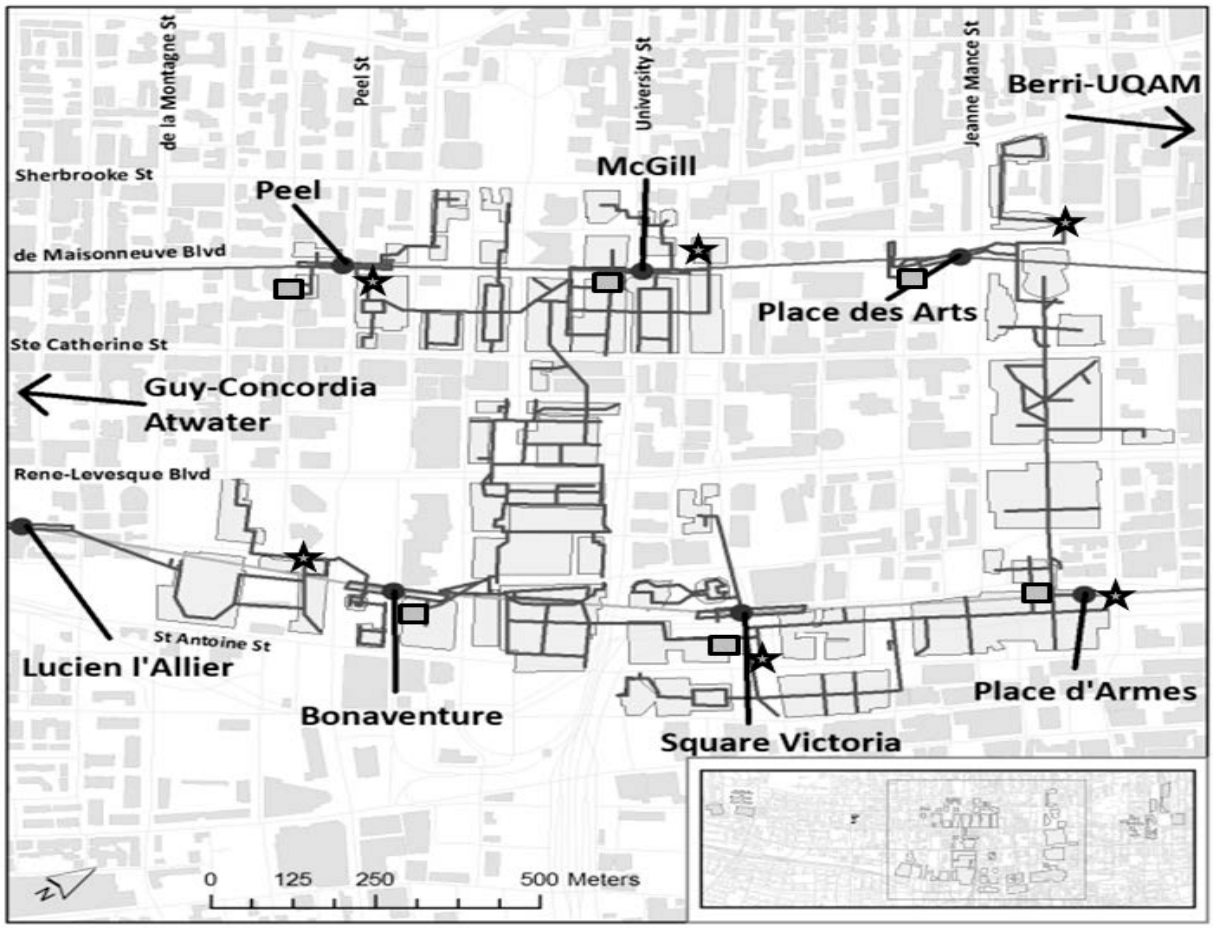

Figure 1.
Map of six Metro stations in Montréal linked to the underground pedestrian network and selected access points
Map sourced from Hagg & El-Geneidy, 2010

4.3. Selection of Metro station access points. There are 25 main access points on six Metro stations (Peel, McGill, Place-des-Arts, Place d'Armes, Square Victoria and Bonaventure) that are connected to the RÉSO. Figure 1 shows the selected access points of the Metro stations that connect to the underground pedestrian network. In this research, two main access (entry/exit) points from each station were purposively selected for auditing. The stars

in Figure 1 denote the first access points selected for each metro station while the squares denote second access points. The selected access points include:

- Metro Peel: 1011 Boul. de Maisonneuve west (Peel east exit - Access Point 1) and 1465 rue Stanley (Access Point 2),
- Metro McGill: 2021 rue Union (Access Point 1) and Boul. de Maisonneuve west beside Eaton Center (Access Point 2),
- Metro Place-des-Arts: 155 rue du President Kennedy (Access Point 1) and 2020 rue de Bleury (Access Point 2),
- Metro Place d'Armes: 960 rue Saint Urbain (Access Point 1) and rue Viger west access point (Access Point 2),
- Metro Square Victoria: rue Saint Antoine (Access Point 1) and Cote du Beaver Hall (Access Point 2), and,
- Metro Bonaventure: rue des Canadiens-de-Montreal (Access Point 1) and 955 rue de la Cathedrale (Access Point 2).

4.4. Type of structures audited and levels of accessibility. Data collected and audited include the number and type of doors, number of stairs and escalators, curb pavements and presence of route maps. The accessibility audit is conducted at three levels in each Metro station: ground level, interior level (terminal and paths leading to the RÉSO) and terminal/RÉSO to train platform level (Figure 2).

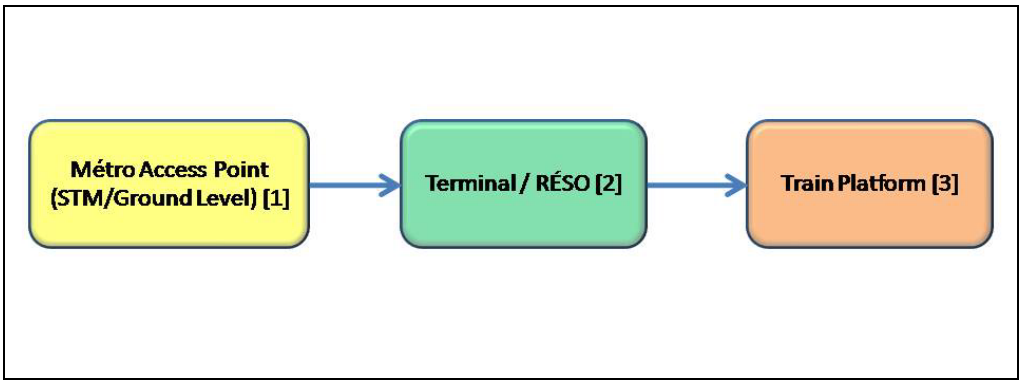

Figure 2.
Schematic diagram of Metro's connectivity to the RÉSO

5. Analysis and Discussion

Montreal's Metro is a swift, convenient, and inexpensive mode of transport, and is one of the most architecturally distinctive subway systems in the world. The stations of the Metro are linked to the 32-kilometer underground pedestrian network (RÉSO) covering an estimated area of 12 square kilometers (4.6 sq mi) of residential and commercial complexes in downtown Montreal.

5.1 Ground Level Accessibility

Curb pavements outside the stations provide accessibility to the three identified users in this research. While most of the stations are accessible at street level, Metro Square Victoria's Saint-Antoine and Metro Bonaventure's de la Cathédrale access points pose challenges for wheelchair users and women with strollers since one has to take stairs to reach the station (Table 1). The European Conference of Ministers of Transport (ECMT, 2006) pointed that a presence of a single step at the entrance or a kerb without a ramp in the road outside a station can make the terminal inaccessible to people with certain disabilities. Although the stations are accessible on the ground, it was noted that kerb ramps were placed far from the Metro stations.

Figure 3.
Doors at Metro Peel east station

The door also serves as barrier for the three types of users. One has to exert considerable effort just to get inside, and would probably be more difficult for a disabled person and the elderly to use (Figure 3). This problem was even documented by CBC News (1989) noting that one has to exert 34 kilograms just to open the door. Sliding doors can be easier for women with child strollers and also require less wheelchair maneuvering space (Access Board, 2002). Route maps are ubiquitous within the stations although legibility and size of text used in the maps could pose a challenge for the visually impaired.

Table 1.
Results of accessibility audit on ground level access of Metro stations

Station / Facilities	Peel		McGill		Place-des-Arts		Place d'Armes		Square Victoria		Bonaventure	
	AP 1	AP 2	AP 1	AP 2	AP 1	AP 2	AP 1	AP 2	AP 1	AP 2	AP 1	AP 2
Kerb Ramp	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of steps in stairs	0	0	2	0	0	0	0	0	22	0	0	4
Number of doors	2	2	2	3	4	1	4	3	3	5	2	2
Type of doors	S	S	S	P/S	P/R	S	S	P	P/S	P/R	S	S
Route Maps	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note:
For type of doors: P – push/pull, S – slide, R – revolving, A – automatic

5.2 Interior Accessibility (Terminal and RÉSO)

The provision of escalators inside the terminal and RÉSO improves accessibility. However, a number of stations provide uni-directional escalators (usually only going up from the platform to terminal) which pose difficulty for women bringing child strollers and wheelchair users. The problems are further compounded whenever these facilities break down or are under repair. The number of steps also poses challenges for the users. The absence of markers on the steps could pose risks for visually impaired users. The longest stairs can be found at Bonaventure and Square Victoria stations (Table 2). The most accessible station, on the other hand, is Place d'Armes. According to Access Board (2002), doors that require both hands to operate as well as revolving doors are considered inaccessible for persons using wheelchairs and strollers. Signage, which assists way finding around the station and RÉSO, presents an obstacle particularly on providing information on accessibility for persons with disabilities (Hagg & El-Geneidy, 2010). Within the terminal, it was observed that accessibility signage for persons with disabilities are not posted legibly within the premises.

Another poorly planned accessible facility is the placement of solitary handrails for mobility impaired users along the corridors of the underground network. These handrails were not connected continuously from the terminal to the nearest building or the Metro station's access point.

Table 2.
Results of accessibility audit on interior access of Métro stations

Station / Facilities	Peel		McGill		Place-des-Arts		Place d'Armes		Square Victoria		Bonaventure	
	AP 1	AP 2	AP 1	AP 2	AP 1	AP 2	AP 1	AP 2	AP 1	AP 2	AP 1	AP 2
Escalators	No	Yes	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	Yes
Direction of Escalators	-	U	U	-	U	U/D	-	-	U/D	U/D	U/D	U/D
Condition of escalators	-	W	W	-	W	W	-	-	W	W	W	W
Number of steps in stairs	40	28	32	57	21	41	3	3	42	60	72	42
Number of doors	0	0	0	6	0	0	0	4	0	2	5	0
Type of doors	-	-	-	P	-	-	-	P/A	-	P	R/A	-
Route Maps	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note:
For direction of escalators: U – going up, D – going down
For condition of escalators: W – working, NW – not working
For type of doors: P – push/pull, S – slide, R – revolving, A – automatic

Figure 4 and Figure 5.
Uni-directional escalator at Metro McGill station and the solitary hand rail for persons with mobility impairments at Metro Square Victoria.

5.3 Terminal/RÉSO to Train Platform Accessibility

Similar to the facilities within the station terminal and RÉSO, accessing the train platform presents constraints to persons with disabilities. The narrow stairs and uni-directional escalators from the terminal to the platform inhibits accessibility for women with child strollers and wheelchair users (Table 3). The gap between the train and the platform presents challenge for those in wheelchair unless STM is informed ahead in order to deploy a ramp (Hagg & El-Geneidy, 2010). Moreover, strong color contrasts and/or tactile pathways set into floors may be used to assist individuals with a visual impairment (Access Board, 2002; Adaptive Environments Center & Barrier Free Environments, 1995). However, the provision of clear markings on the platform is still limited in most stations. Another obstacle for wheelchair users and visually impaired is the absence of platform markings where they could embark or disembark even though there are designated areas for persons with disabilities inside the train.

Table 3.
Results of accessibility audit on train platform access of Métro stations

Station / Facilities	Peel		McGill		Place-des-Arts		Place d'Armes		Square Victoria		Bonaventure	
	AP 1	AP 2	AP 1	AP 2	AP 1	AP 2	AP 1	AP 2	AP 1	AP 2	AP 1	AP 2
Escalators	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Yes	Yes	Yes
Direction of Escalators	U	U/ D	U	U	-	-	-	-	U	U	U	U
Condition of escalators	N W	N W	W	W	-	-	-	-	W	W	W	W
Number of steps in stairs	22	22	30	30	21	24	30	30	28	28	32	32
Route Maps	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note:
For direction of escalators: U – going up, D – going down
For condition of escalators: W – working, NW – not working

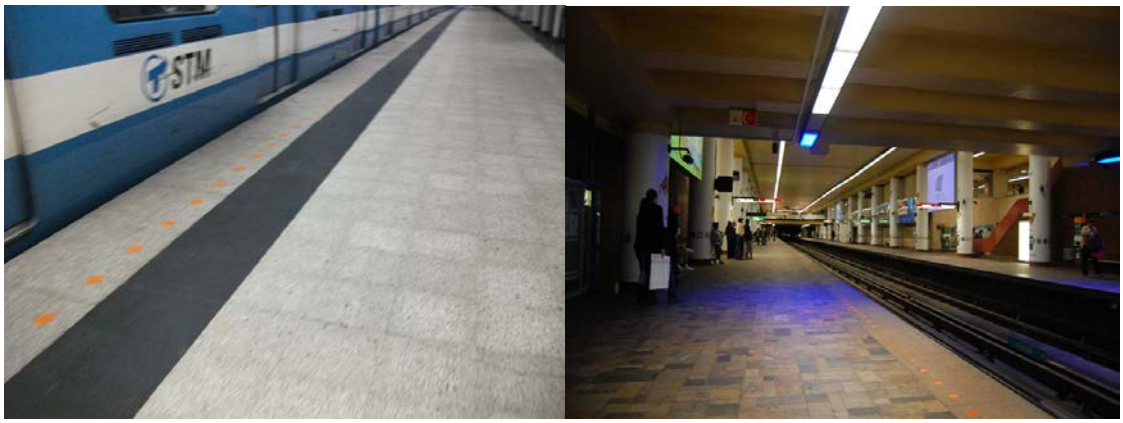

Figure 6 and Figure 7.
Aside from the obvious gap between the train and the platform, the absence of platform markings where persons with disabilities could embark/disembark the train provides obstacles for accessing the Metro.

While STM is strong in its stance on universal accessibility, the use of mass transit can be attributed to the individual's perception of whether the facilities located within the transit are user-friendly or discriminating. According to Wener and Evans (2007), "the choice of commuting mode is the result of individual decisions that are strongly influenced by a wide variety management, design, infrastructure, and policy decisions by governments and transit agencies". Not all users are able to afford driving a motor vehicle, thus, using public transportation becomes an indispensable component for persons with disabilities to achieve productivity and independence.

6. Conclusions

The physical connectivity of Montreal's Metro station to the underground network provides opportunities for users to access both the train and buildings in downtown, serve as a way of separating pedestrians and traffic which leads to better mobility and as a refuge during harsh weather. However, not all users are able to access both Metro and the underground network as seamless as possible. Wheelchair users, visually impaired persons and women with child strollers encounter constraints to accessibility in one form or another. At the ground level, the door alone provides a biggest challenge for the three types of users given that it takes a lot of effort just to open it. The stairs and uni-directional escalators also pose difficulties for them. In the event of escalator breakdown and repairs, wheelchair users and women with child strollers would feel helpless in going in/out of the Metro as well moving around the underground network. Indeed, land use and transport planning influences accessibility through the design of the physical environment by ensuring that places and environment should be barrier-free, inclusive and accessible to all. It is noted that universal accessibility policies are still at the earliest stage of

development in Montréal compared to other cities in Canada and that the underground networks linked to the Metro are privately owned. Thus, overall retrofitting and improvement of the stations and the underground network would take some time to implement. The simple accessibility audit of this research shows the need to incorporate small improvements to the physical accessibility of the Metro stations to allow a number of persons with disabilities to use the system. A number of things to consider for improvement include:

- Providing announcement/information on STM website or through Montreal newspaper of any breakdowns or repairs undertaken on the escalators.
- Providing clear platform markings where wheelchair users or other persons with disabilities could embark/disembark the train.
- Ensuring that the doors leading to the Metro station and underground network be well maintained and easy to open.

For further studies, there is a need to investigate travel behavior of the three types of users identified as well as probing deeper into their perceptions and experiences related to using the Metro. Also, analysis and conclusions of this study were dependent on only two selected access points in each of the six Metro stations which raises the need to cover the whole access points in the future.

Bibliography

Access Board. (2002). *Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities*. *Children* (Vol. 1111). Washington D.C., USA: U.S. Architectural and Transportation Barriers Compliance Board.

Adaptive Environments Center, I., & Barrier Free Environments, I. (1995). *The Americans with Disabilities Act Checklist for Readily Achievable Barrier Removal*. USA.

AlterGo (1992). Access-Ability for Persons with Disabilities. A Practical Guide for Organizers of Public Events. The Regional Association for the Recreation of Disabled Persons of the Island of Montréal.

Audirac, I. (2008). Accessing Transit as Universal Design. *Journal of Planning Literature, 23*(1), 4-16.

Barker, M. (1986). Toronto's Underground Pedestrian System. *Tunelling and Underground Space Technology, 1*(2), 145-151.

Barrett, E., Heycock, M., Hick, D., & Judge, E. (2003). The case of the Leeds Transport Strategy. *Policy Studies, 24*(4), 227-242.

Boisvert, M. (2002). From connexity to connectivity : Enhancing the efficiency of interior walkways with the current extensions of the Montrèal's indoor city. In *Urban Underground Space: A Resource for Cities*. Torino, Italy.

Boivin, D. (1991). Montreal's Underground Network: A Study of the Downtown Pedestrian System, *Tunelling and Underground Space Technology, 6*(1), 83-91.

Bromley, R., Matthews, D. & Thomas, C. J. (2007). City centre accessibility for wheelchair users: The consumer perspective and the planning implications. *Cities, 24*(3), 229-241.

CBC (1989). "The heavy door phenomenon", Canadian Broadcasting Centre Digital Archive. Retrieved on 22 March 2010 from http://archives.cbc.ca/science_technology/transportation/topics/1099-6127/.

City of Montreal. (2002). Montreal Master Plan. Retrieved on 09 March 2010 from http://ville.montreal.qc.ca/portal/page?_pageid=2762,3099643&_dad=portal&_schema=PORTAL.

City of Montreal. (2007). A barrier-free city: Montréal has universal accessibility at heart! Retrieved on 09 March 2010 from http://www.altergo.net/documents/MAJDOC70716/Montreal_A_barrier-free_city.pdf.

CRADI (2009). Plan d'action 2008-2009. Comité régional des associations pour la déficience intellectuelle, Montreal.

Durmisevic, S. (1999). The future of the underground space. *Cities, 16*(4), 233-245.

Durmisevic, S. & Sariyildiz, S. (2001). A systematic quality assessment of underground spaces - public transport stations. *Cities, 18*(1), 13-23.

ECMT. (2006). *Improving Transport Accessibility for All: Guide to Good Practice*. European Conference of Ministers of Transport, Paris: OECD.

El-Geneidy, A., & Levinson, D. (2006). Access to Destinations: Development of Accessibility Measures. *Transportation Research*. Minnesota, USA.

Ex Aequo (2008). Transportation objectives. Retrieved on 24 March 2010 from http://www.exaequo.net/spip.php?article16.

Hagg, M. & El-Geneidy, A. (2010). Making Montreal's Indoor City Accessible for People with Disabilities. Paper presented in *Transportation Research Board 89th Annual Meeting*. Washington D.C., USA.

ITACUS. (2009). Underground Space: Q&A. International Tunneling and Underground Space Association Committee on Underground Space, Switzerland.

Iwarsson, S., & Ståhl, A. (2003). Accessibility, usability and universal design — positioning and definition of concepts describing person-environment relationships. *Disability & Rehabilitation, 25*(2), 57-66.

Maitland, B. (1992). Hidden cities: The irresistible rise of the North American interior city. *Cities, 9*(3), 162-169.

Marston, J., Golledge, R., & Costanzo, C. M. (1997). Investigating Travel Behavior of Nondriving Blind and Vision Impaired People: The Role of Public Transit. *The Professional Geographer, 49*(2), 235-245.

Pressman, N. (1988). Developing Climate-responsive Winter Cities. *Energy and Buildings, 11*(1-3), 11-22.

Project Universal Access. (2010). Principles of Universal Access. Retrieved on 14 January 2010 from http://www.humantransport.org/universalaccess/page2.html.

Societe Logique (2003). Definition of Universal Accessibility. Retrieved on 24 March 2010 from http://www.altergo.net/documents/accessibility_definition_en.pdf.

Statistics Canada. (2002). A Profile of Disability in Canada, 2001. 2001 Participation and Activity Limitation Survey. Ottawa.

Statistics Canada. (2004). Canada Profile of Disability in 2001. Canada Social Trends. Ottawa.

STM. (2009a). STM Corporate Policy on Universal Accessibility. *Société de transport de Montréal*.

STM. (2009b). Five Accessible Stations in the Metro. *Société de transport de Montréal*.

Table de concertation des aînés de l'île de Montréal. (2009). Seniors' mobility and transportation in Montreal. Retrieved on 22 November 2009 from http://www.tcaim.org/Rapport_Transport_et_Mobilite_TCAIM_Summary.pdf.

Wener, R. E., & Evans, G. W. (2007). A Morning Stroll: Levels of Physical Activity in Car and Mass Transit Commuting. *Environment and Behavior*, *39*(1), 62-74.

Zacharias, J. (2003). Montreal's Underground Labyrinth. In *EFUC – Konferenz 2003 on 'Underground Construction'*. Suderburg, Germany.