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Montréal's roots

Exploring the growth of Montréal's Indoor City

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Abstract: Indoor pedestrian pathways are increasingly common in cities worldwide. Montréal's Indoor City is one of the most expansive indoor pedestrian networks in the world, extending for more than 32 kilometers (19.88 miles) and covering an area of twelve square kilometers (4.6 square miles) in the city's downtown. The benefits associated with the growth of Montréal's indoor network are numerous, including: improved access throughout the downtown; shorter pedestrian walking distances; year-round climate protection; and increased amounts of public spaces. The research described in this paper examines the historical growth of Montréal's Indoor City, with the aim of exploring the factors that caused its rapid growth. Specifically, changes in pedestrian access to retail space over time are modeled in a geographic information system to highlight major phases in the growth of the network. This research develops a theoretical framework, constructs a comprehensive time sequence describing the growth of the Indoor City's pedestrian network, and interprets the results to convey the lessons learned from Montréal's planning policies towards the Indoor City. The results of this research suggest that a series of plans and administrative policies adopted by the City of Montréal over the past 45 years have had a significant impact on the growth of the Indoor City. At the same time, it is also clear that access to retail and public transit (especially the underground metro lines), as well as a loophole in the Montréal legislative system, have had significant effects on the growth of the Indoor City.

Keywords: Access; Pedestrian; Indoor City; Underground; Retail

1 Introduction

During the the twentieth century, streets came to be viewed as contributors to the social spaces of the city, and no longer as spaces that people simply pass through (Gehl 1987; Jacobs 1961). Planned pedestrian environments received more attention in the twentieth century than they had previously. This was largely a reaction to the motorization of transportation (Zacharias 2001). Although pedestrians and automobiles once shared the public space of the roadway, the introduction of the sidewalk offered pedestrians a protected space of their own. This segregation was taken a step further by the introduction of underground walkways and elevated "skyways," which granted pedestrians a space entirely separate from the street-level circulation system (Robertson 1993). The development of these systems occurred in response to the heavy concentration of automobiles in downtown areas and the associated decrease in pedestrian activity in these areas. These indoor networks are distinguished from traditional street-level concourses by their functions, purposes, and interaction with other transportation systems.

Around the world, indoor pedestrian networks have developed as important environments that host a wide range of activities, especially in downtown areas. In Canada, Montréal's Indoor City, Toronto's PATH and Edmonton's Pedway underground pedestrian routes have gained fame, as have similar systems in other countries such as the Forum des Halles in Paris, Japan's Crysta Nagahori, and Singapore's CityLink Mall. Above-grade systems are also common in North America, such as the Skyway system in Minneapolis and Calgary's PLUS 15. At least 85 cities in North America have some kind of skyway or tunnel linkage to isolate pedestrians; 30 of these are well-developed systems (Maitland 1992). High density, connectivity, and quality of life are three key elements in sustaining a successful indoor pedestrian environment that is distinguishable from the street environment (Rotmeyer 2006). Underground pedestrian network have several benefits. From

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a planning perspective, one of the most important benefits of an indoor pedestrian network is the increase in pedestrian access to amenities that can be provided along the network, as well as and to destinations in the city's core.

Zacharias (2001) explains that Asia's underground networks are intended to separate pedestrians from car traffic, whereas in North America, they are intended as refuges from extreme weather (cold or heat). Indeed, the scarcity of space is an acute problem in many Asian cities; underground development is a way to recover part of the high cost of land and to use urban space more efficiently (Barles and Jardel 2005). In North America, underground development is a way for real estate owners to increase profits: property values in areas served by pedestrian networks tend to increase, and the networks also create opportunities to incorporate high-rent retail spaces into an expanded building base. In Montréal, the Indoor City benefited from a legislative loophole in which below-grade space was not calculated as part of the Floor Area Ratio; this gave developers additional area without sacrificing building heights (Belanger 2007). From the City of Montréal's perspective, the development of the underground pedestrian network positioned the city as an international reference for sustainable development strategies, while also improving the access to public spaces, retail areas, and cultural facilities. Moreover, an indoor pedestrian network increases the amount of public space available in a downtown area (Besner 2002).

One of the most interesting aspects of the development of grade-separated pedestrian networks is the shift in location of commerce from ground level to below ground or above grade. For instance, in 1965, all of the retail space in Montréal's downtown was above-ground street frontages; today, however, more than two-thirds of the commercial space in the Central Business District (CBD) is directly accessible through the Indoor City walkways (Zacharias 2000). Whyte (1980) reasoned that the main attraction in urban spaces for people is, in fact, other people, which can partially explain the shift of retail to the indoor city. In general, it can be said that retail locates in areas with higher levels of pedestrian activity (Lorch and Smith 1993). There is an abundance of literature dedicated to retail location theory and the indoor commercial space of the mall environment; however, little research has focused on the retail activity within underground pedestrian networks and how these networks have emerged over time.

Research on network growth applied to the transportation field is mostly oriented towards road networks, which follow a different logic from indoor pedestrian networks. More information related to growth in transportation networks can be found in Zhang and Levinson (2007) and Xie and Levinson (2009). The literature available is of limited use for the purpose of the present article. Nevertheless, a few papers were found to be particularly relevant to this study. Corbett *et al.* (2009) examine the development of the Minneapolis Skyway network and attempt to identify factors influencing the order in which links are generated. The researchers find that physical, economic and legal factors all played roles in the growth of the skyway network while the levels of access to office and retail space do remain as an important factor in predicting the growth of the skyway network. Belanger (2007) examines the factors that affected the growth of the Toronto underground network. A notable point in this paper is the effect of the Montréal experience and how it has helped to ignite the growth of the Toronto system. The author links the growth of the indoor pedestrian network to the growth of retail and commercial businesses in the Toronto downtown area.

The research described in the present article examines the growth of Montréal's Indoor City and pedestrian network with the aim of determining whether knowledge of past events can help us understand the network's potential future growth. The first part of this paper presents a discussion of the factors that were present during the initial development of the Indoor City. The second section models the changes in pedestrian access to retail space in the Indoor City over the past 45 years. The paper concludes with a critical look at how the City of Montréal's past and present policies have affected the growth of the Indoor City and identifies milestone events during the growth of the network.

2 Methodology

Drawing from scholarly articles, newspapers, and maps dating back to 1962, a detailed chronology of the Indoor City's expansion has been developed. A total of 66 buildings joined the Indoor City network between 1962 and 2006. In addition, information on links completed after initial construction was obtained from the same sources. As much as possible, the year of a link opening was used as the base in understanding when the buildings were linked to the network. When this information was not available, the year of construction or opening of the building through which a given link runs was used. During this process, several variables were recorded for each building linked to the Indoor City: Building Age, Age of Linkage to the Network, Building Square Footage, Retail Square Footage, Number of Floors, Number of Towers, Availability of Indoor Parking, Metro Connections, and Length of Segment of Indoor City. The Indoor City network was modeled in a Geographic Information System (GIS). A walking matrix was

generated using an origin-destination application in GIS. The generated OD matrix measures the levels of pedestrian access to retail from every building in the indoor city as an origin to every other building as a destination. This was done for each year throughout the entire growth period of the Indoor City. There are two components to the analysis:

- The first section of the analysis focuses on the major factors contributing to the establishment and growth of Montréal's Indoor City. Here, factors relating to climate, urban form, planning tools, financing, and key stakeholders are discussed in detail.
- The second section identifies the key cycles of growth and combines that with an analysis of the change in pedestrian access to retail space over time. Access is interpreted as a measure of the amount of retail space that can be reached by walking through the Indoor City. This section includes a visual representation of access to retail space over time.

3 The Indoor City case study

Montréal is home to one of the most expansive indoor pedestrian networks in the world. Thirty-two kilometers (19.88 miles) in length, the indoor public walkway network covers an area of 12 square kilometers (4.6 square miles) in the city's downtown core. The network consists of tunnels, corridors and atriums linking 66 real estate complexes. Within these complexes, pedestrians can access offices, retail businesses, hotels, government institutions, cultural facilities, residential areas, recreational opportunities, and transportation services (ten Metro stations, two commuter rail stations, and two regional bus stations). Used by more than 500,000 pedestrians every day, the underground network connects approximately 80 percent of downtown office space, 35 percent of retail space, 1600 housing units, and 10,000 indoor public parking spaces (Besner 1997; Sijpkes and Brown 1997). Until recently, Montréal's indoor walkway was often referred to as the "Underground City" or "Ville Souterraine"; however, this is a misnomer because the network is only partially below ground. In fact, about half of the network is located at or above ground level, so the term Indoor City is more accurate. In 2004, the downtown portion of the underground system was branded as the RÉSO (from the French *réseau*, meaning "network"). Figure 1 shows the growth of the Montréal Indoor City between 1962 and 2006. It is clear from the layout and continual growth of the pedestrian system that its development was never based on a master plan—the network grew organically over a period of 45 years (Besner 1997; Shostack 1978). Figure 2 is a set of photographs taken within the Indoor City to help the reader understand the Indoor City's network and environment.

3.1 Factors surrounding the conception of the Indoor City

The evolution of the Indoor City began well before the construction of Place Ville Marie in 1962. In reality, there were numerous factors and policies at play in Montréal prior to the birth of the Indoor City.

Visionary thinkers

Above all, it was the decision by the Canadian National Railway Company (CN) to develop a large tract of its land, and the local government's support of that decision, that provided the crucial impetus to the creation of the Indoor City. The original concept of underground corridors to connect buildings was made in a proposal to the CN put forward by Hugh Jones in 1929. The location of the current downtown[1] is based on the fact that between the years of 1912 and 1918 the CN Railway company put in place a rail line that tunneled through Mount Royal and straight through the heart of the island, leaving an enormous open trench from the south of Cathcart Street to Central Station (90 000 m^2; 968 750 sq. ft.) broken over three quadrilaterals). The development of the Indoor City was only realized through the coordination of New York promoter Bill Zeckendorf, architects I.M. Pei and Henry Cobb, and urban Planner Vincent Ponte, who has been rightfully recognized as the driving force behind Montréal's indoor scheme.

Additionally, the policies of politicians including Jean Drapeau, Jean Lesage, and Jean Doré made the Indoor City possible. During the 1960s, the newly elected Liberal government of Jean Lesage instituted reforms that encouraged francophone Québecers to engage in business, therefore increasing the political and economic influence of the francophone community. The policies of Montréal's Mayor Jean Drapeau (1954–1957; 1960–1986) were largely oriented around international grand events, such as Expo 67 and later the 1976 Olympics and the 1980 Floralies. Essentially, Drapeau allowed the Indoor City to flourish by bringing aid to several international events and megaprojects (Augustin, 1996); this period saw the construction of many of Montréal's skyscrapers, as well as the Metro system that had a significant impact on the growth of the Indoor City.

[1] Montreal's original downtown area is now known as the "Old Port."

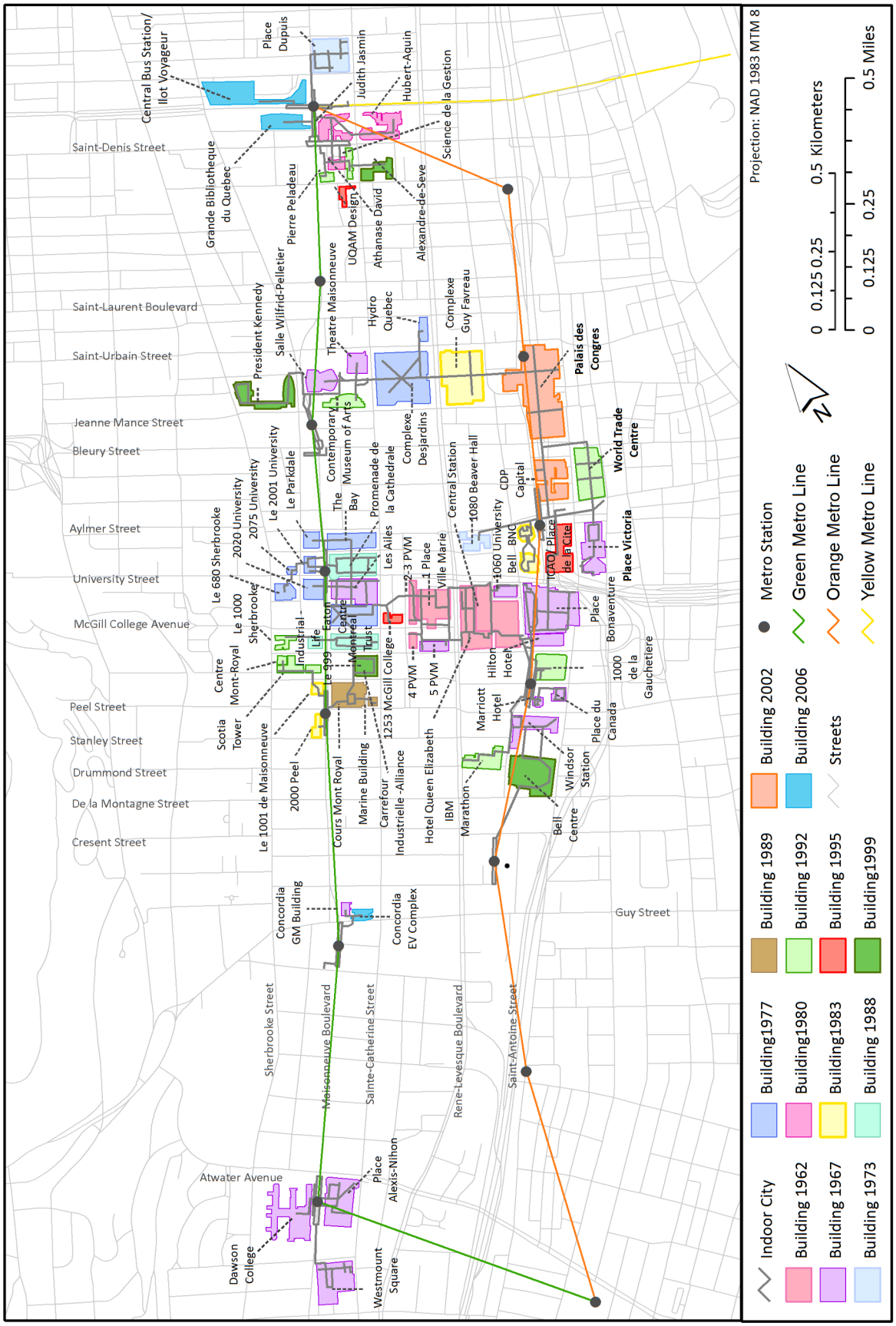

Figure 1: General growth of Montréal's Indoor City.

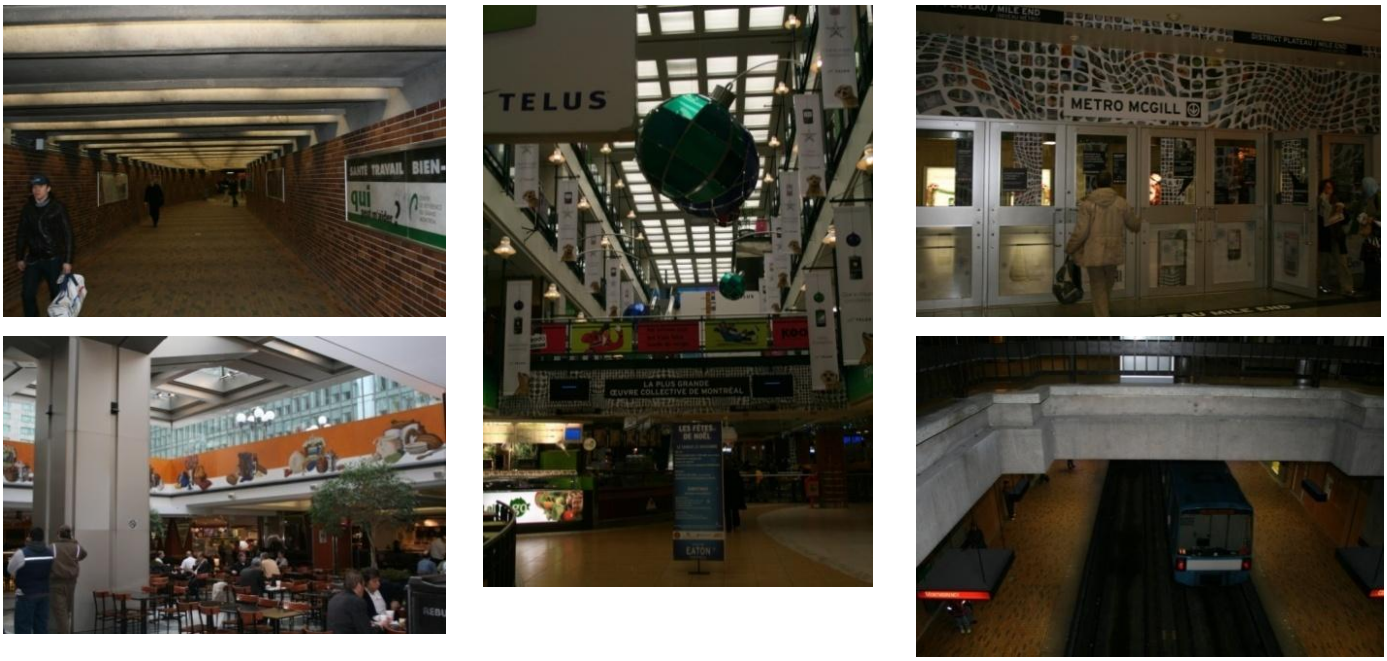

Figure 2: Photographs of the Indoor City.

Quebec's economy experienced hardships in the 1970s and 1980s, as political unrest in the province encouraged businesses to shift from Montréal to Toronto. The 1980 victory of the separatist Parti Québécois and the first referendum on Quebec sovereignty led to an exodus of capital; business head offices moved elsewhere (particularly Toronto), as did 300 000 English-speaking Québecers. Faced with suburban competition and an uncertain economy, it was feared that further expansion of the Indoor City along the east-west axis would siphon business from above and be detrimental to Ste-Catherine Street, the city's main commercial artery. These concerns, coupled with claims that the downtown retail market had become saturated, led the 1990s city administration to enact a moratorium on further extensions of the Indoor City.

Drapeau's successor, Mayor Jean Doré (1986–1994), engaged more actively with the planning and coordination of the Indoor City, proposing measures to ensure a better balance between street-level businesses and those in the Indoor City (Augustin 1996). By the late 1990s, Montréal's economic climate had improved, and the city attracted several international organizations to move their secretariats to the Quartier International de Montréal (QIM).

The 2004 Montréal Master Plan (City of Montréal 2004) adopted a new tone towards the Indoor City by emphasizing system consolidation rather than further expansion. This plan advocated improving interaction between the indoor and outdoor systems, providing universal access throughout the system, further expanding the way-finding signage in the RÉSO, implementing design standards, and capitalizing on the Indoor City to increase the modal share of public transportation. In other words, the city chose to focus on improving the quality of existing links rather than generating new ones.

Most recently, Montréal's 2007 Transportation Plan (City of Montréal 2007) indicates that the City has adopted a position that once more favors the expansion of the Indoor City. This plan recognized the need to seize the opportunity to help consolidate the underground network further, including extensions to link it to the new QIM and the extension of the "cultural axis" in the eastern part of the Indoor City as part of the new Quartier des Spectacles development. Despite the preparation of several Master Plans for the downtown area, there has yet to be a development plan for the Indoor City.

Climatic factors

Montréal's climate has often been cited as a prime motivation for the development of the Indoor City. The indoor walkways create an artificially climate-controlled space that is capable of overcoming local temperatures that reach 30 °C in summer and −30 °C in winter. In tracing the history of the Indoor City, Anderson (1976) praises the walkways for the protection that they afford from the weather outdoors. However, as Barles and Jardel (2005) explain, climate was certainly not the principal motivation for developing the Indoor City; rather,

climate protection was a gained advantage. The original motivation behind the creation of the Indoor City was CN's desire to get additional value out of its properties, as previously mentioned. Evidently, the argument concerning climate protection is only applicable during periods of extreme temperatures. Still, climate is one of the factors that encouraged the Indoor City's growth.

The compactness of the city

The unusual pattern of urban functions in Montréal's downtown served as an enabling factor for the development of the Indoor City. The gridiron street pattern of the city is quite consistent. Montréal's downtown, bounded by the Mount Royal to the north and the St. Lawrence River to the south, covers a rectangular area of approximately 12 km^2 (4.6 square miles). The fact that it is bounded by two geographic features contributes to the city's high density and congestion. Montréal's building boom in the early 1960s heightened this congestion: as the amount of office space increased, so did the number of pedestrians in the CBD (Shostack 1978). It is this pattern of activity that allowed for the viability of Montréal's Metro system, which attracted a large pedestrian population in the downtown area. Today, more than three million people inhabit Montréal's metropolitan region, and daily passenger activity on the Metro is estimated to be around 700 000 riders. The benefits of access to the Metro encouraged almost every new building between 1967 and 2006 to be linked at construction to at least one station through the Indoor City.

Montréal's downtown still has many vacant and underused lots, many of which currently serve as surface parking. Several planning documents have emphasized the high number of vacant lots and highlighted the potential to develop additional housing units. The 2004 Montréal Master Plan indicates that there remains 0.6 square km (0.37 square mile) of vacant lots in downtown Montréal (Barles and Jardel 2005).

Planning tools

Planning tools such as density bonuses and zoning incentives facilitated negotiations between building owners, developers and the local government. The advent of the density bonus made it advantageous for developers of large projects in Montréal to include open plazas in their complexes because a "plaza bonus" permitted four to six square feet of additional built area in a complex for each square foot (0.09 square meter) of plaza space provided. Additionally, the FAR (floor area ratio) factor, which limited the density of developments, favored underground constructions: FARs were calculated from the "mean grade level," meaning below-grade shopping concourses were not included in the FAR calculations. The City of Montréal also encouraged developers to provide connections to the Indoor City through zoning incentives. This planning tool allowed developers to exceed their allotted FARs if they provided a desired amenity, such as a connection to the Indoor City (Shostack 1978). In addition to the FAR factor, the presence of the Metro system and the number of people it carried to and from the CBD every day has played an important role in the growth of the Indoor City. Most, if not all, of the links in the Indoor City connect to a major Metro or rail station, and the rest of the pieces grew around these stations.

Financing

The central role of the private sector in the development and financing of the Indoor City has been well documented (Augustin 1996; Besner 1997)(Augustin, 1996, Magder, Februaury 29, 2008, Besner, 1997). According to Boisvert (2002), public investments and guidelines have played a minor role, since the underground space is considered private rather than public, with the exception of areas beneath public land. However, Barles and Jardel (2005) and Augustin (1996) question whether the development of the Indoor City has completely escaped the control of the public sector. In 1964, the City of Montréal began searching for developers to erect buildings on the lots it had purchased during the construction of the Metro. According to Barles and Jardel, the projects directly attached to Metro stations were much more complex because they involved emphyteutic leases[2] between the owners of the buildings and the City, taking on a form of public-private development partnerships. This form was the first incentive used by the City of Montréal to encourage the growth of the Indoor City (Besner 1997). By offering the air rights above Metro station entrances, ten buildings were already connected to the system by the time the Metro was inaugurated in 1966, in-

[2] An emphyteutic lease is defined in Canadian civil law as a long-term lease of land or buildings (99 years or similar, or even in perpetuity. The Civil Code of Quebec, at §1195, 1197 and 1200, defines emphyteusis as: "the right which, for a certain time, grants a person the full benefit and enjoyment of an immovable owned by another provided he does not endanger its existence and undertakes to make constructions, works or plantations thereon that durably increase its value." "The emphyteutic lessee has all the rights in the immovable that are attached to the quality of owner, subject to the restrictions contained in this chapter and in the act constituting emphyteusis." "The term of the emphyteusis shall be stipulated in the constituting act and be not less than 10 nor more than 100 years." Source: www.duhaime.org/LegalDictionary.

cluding all entrances to the Peel, McGill, Guy-Concordia, and Place d'Armes Metro stations (Shostack 1978).

Augustin (1996) believes that the planning of the initial segments of the Indoor City was generally aimed at benefiting the promoters and developers of the complexes connected to the new pedestrian network. However, he is not convinced that this is true for the cultural-governmental axis east of downtown. Built after the initial business segment of the network, the portion of the Indoor City encompassing the Place des Arts, Complexe Desjardins, Complexe Guy Favreau, and Palais des Congrès is made up of buildings geared towards cultural and governmental functions. Nonetheless, the majority of the network has been the realization of private investments and this trend continues to the present day. In 2007, the city owned approximately 10 percent of the Indoor City, with the remaining 90 percent split between more than 60 private owners (Magder, Februaury 29, 2008).

3.2 Lessons learned

Interestingly, much criticism has been directed at the City of Montréal for their planning polices related to zoning and FARs. According to Anderson (1976), zoning and FAR controls are to blame for "a rash of projects which pay lip service to the original concept of an enclosed or interior public environment but which negate or eliminate the traditional qualities of the surrounding streets." Specifically, he notes that shopping has been siphoned to the underground to take advantage of the FAR rule, resulting in blank facades and lifeless streets above ground. Additionally, the city's requirements for direct off-street truck loading facilities and parking entrances have produced blank facades that extend for entire blocks. In regards to parking requirements, Anderson claims that city regulations have made large complexes even more oppressive. Specifically, the practice of placing shopping levels underground to avoid any negative effects on the FAR has caused parking to be elevated above the street level, creating blank boxes four to six stories tall. Sijpkes and Brown (1997) attest to this, claiming that many of the buildings built during the 1970s were essentially "boxes built in the banal late modernist style of the time." To them, a fascination with the "megabuilding" aspect of the indoor city resulted in minimal consideration for the deteriorating outdoor streetscape. They note that certain streets in particular were victims of this style, such as President Kennedy Avenue and Cathcart Street (Figure 3), which is lined with blank walls and garage entrances. This is a noteworthy illustration of the impact of the Indoor City on urban morphology and architecture. However, this simple or "poor" architecture style was the modern style worldwide, for many other reasons, and perhaps was amplified in Montréal by the presence of the Indoor City network.

Figure 3: Blank walls and garage entrances.

3.3 Phases in the growth of the Indoor City

A total of 66 buildings were linked to the Indoor City network between 1962 and 2006. The network growth curve shown in Figure 4 serves as a visual representation of the cumulative growth (length in meters) of the Indoor City over the past 45 years. The shape of the growth curve indicates that the Indoor City has grown at a fairly steady pace, with intermittent periods during which few network extensions were made.

A summary of the growth in the number of linked buildings by year is presented in Table 1. It is clear that there were three years where several buildings were linked to the Indoor City. The three biggest expansions of the Indoor City, during which several buildings were linked to the network in a single year, occurred in 1967, 1977 and 1992. These three years of significant growth mark the three phases in the growth of the Indoor City: Conception, Expansion, and Maturity. These phases also reflect the evolution of the economy of the city in general. The 1960s and 1970s were prosperous decades, coin-

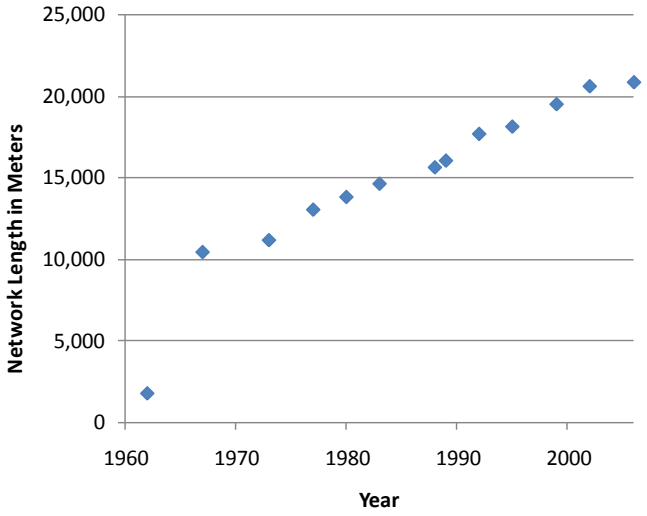

Figure 4: Network Growth of the Montréal Indoor City

ciding with the development of many infrastructure components. Then, in the 1980s, the accumulated debt slowed down the pace of economy, which became progressively stronger in the 1990s.

It is important to note that not all buildings constructed were associated with an increase in retail space. Some of the buildings were mainly government facilities with office space, or university buildings with no office space established at the time of construction.

The remainder of this section comprises an overview of key events that occurred during the three major phases of the Indoor City's history (Conception, Expansion, and Maturity) as well as an analysis that can help in understanding these phases and their importance in the growth of the Indoor City. The value of key events in every phase is demonstrated by changes in the level of access to retail space as new areas are added to the network. Access is measured as the amount (in square meters) of retail space that can be reached by walking inside the Indoor City at the end of a year, and the change in access is calculated as the difference between the levels of access at the end of a year and the end of the previous year. Figures 5, 6, and 7 depict a series of maps measuring the change in the level of access to retail space in the Indoor City during three different time periods (1962–1967, 1973–1977, and 1992–1995). This part of the analysis is focused on changes in the level of access to actual retail space, which includes active and inactive space. Modeling active retail space only would require tracking every store in the entire Indoor City over a period of 45 years, which is beyond the scope of the present study.

Phase I: Conception (1960s)

The spine of the Indoor City was initially created by the linking of the Place Ville-Marie complex, the CN Central Station and headquarters, the Queen Elizabeth Hotel, Place Bonaventure, the Chateau Champlain Hotel, and the Place du Canada between the years of 1962 and 1967. The origins of this segment of the Indoor City can be traced back to 1959, when the CN Company decided to develop the air rights above their rail lines by building a train terminal in the heart of downtown Montréal, as discussed previously. The trench created by this project remained open until the 1950s, when CN decided to build their head office in the location occupied today by the Place Ville-Marie complex (Besner 1997; Boisvert 2002; Boivin 1991). The second phase of CN's redevelopment scheme involved a six-acre parcel to the south of the Place Ville-Marie complex, on which the Place Bonaventure convention center was constructed in 1967 (Shostack 1978).

Figure 5 covers 1962–1967, a period in which several Metro lines associated with Expo 1967 were constructed. We consider this time period as the birth of the Indoor City. Beginning in 1966, the construction of the Metro system created the spine upon which the Indoor City took shape.

Phase II: Expansion (1970s)

A second portion of the Indoor City debuted with the 1976 construction of the Complexe Desjardins on the eastern edge of the downtown area. This portion was constructed as part of the City of Montréal's preparation for the summer Olympics.

The 1973–1977 map shows the change in access to retail space after the 1976 Olympic Games. It is clear that access to retail space increased on the eastern side of downtown, where several buildings devoted to cultural uses were constructed.

Phase III: Maturity (1980s to present)

The late 1980s ushered in a new phase of growth for the Indoor City. During this period, three major shopping centers were connected to the Indoor City via the Peel and McGill Metro Stations, establishing a strong east-west retail axis. The 1980s were also important years for the institutional function of the Indoor City, with Montréal's University of Quebec (UQAM) connecting several of its main pavilions to the Indoor City via the Berri-UQAM Metro. In the 1990s, several megaprojects were undertaken in the downtown area; most of these projects were connected to the Indoor City. A newly constructed tunnel between the McGill and Square-Victoria Metro stations was finally completed in 1995 (Boisvert 2002), connecting the two major Metro lines. The 2003 redevelopment of

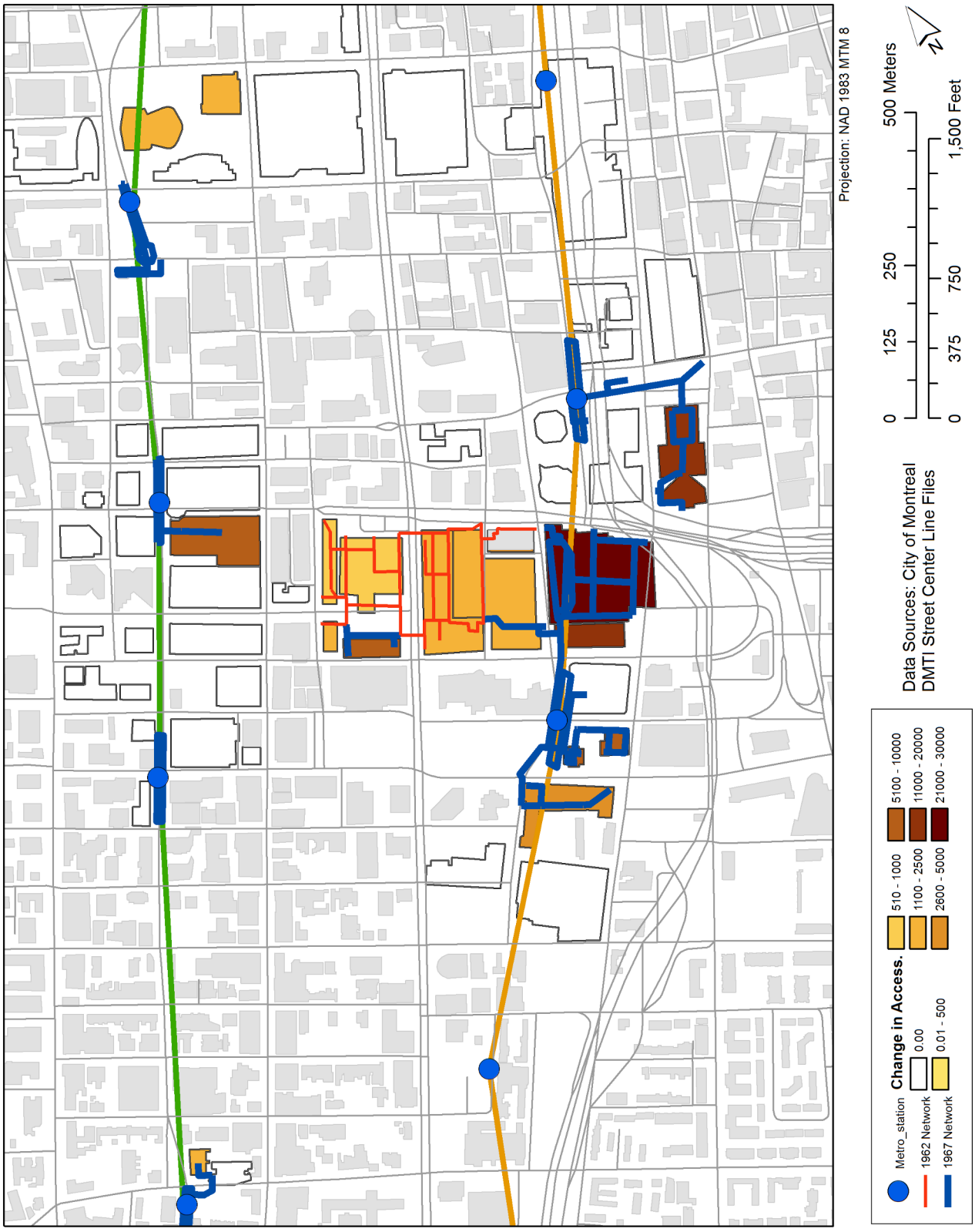

Figure 5: Change in access to retail space measured in square meters between 1962 and 1967.

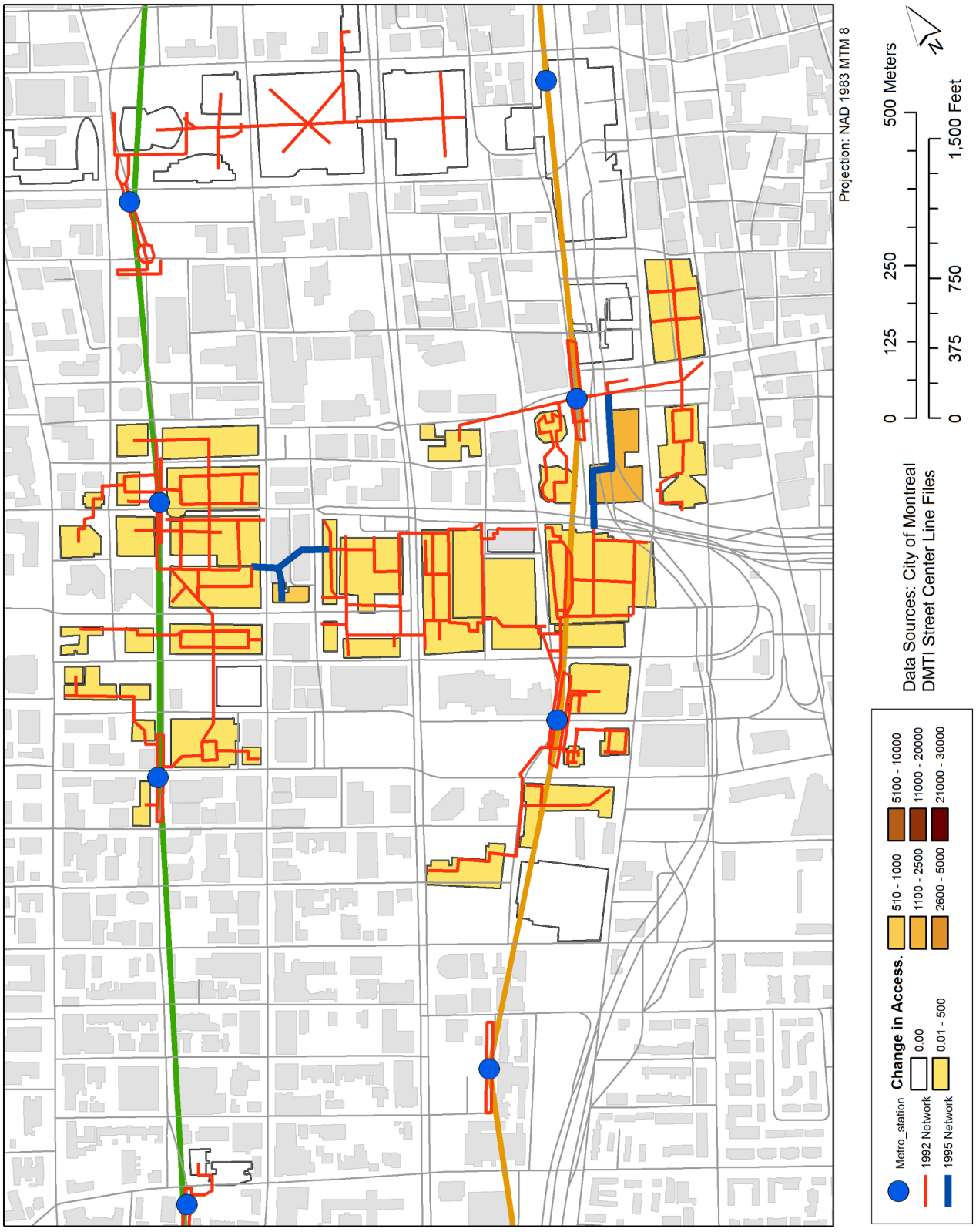

Figure 6: Change in access to retail space measured in square meters between 1973 and 1977.

Table 1: Summary of Indoor City growth.

Year	Number of Buildings Linked	Percentage of Total Buildings	Office Space		Retail Space	
			Sq. Meters	Sq. Feet	Sq. Meters	Sq. Feet
1962	6	9.09	347 680	3 742 391	22 840	245 853
1967	14	21.21	1 261 037	13 573 694	160 197	1 724 350
1973	2	3.03	235 919	2 539 408	6782	73 000
1977	9	13.64	678 539	7 303 732	108 789	1 171 000
1980	3	4.55	81 940	882 000	0	0
1983	5	7.58	417 075	4 489 354	0	0
1988	3	4.55	125 699	1 353 017	42 658	459 169
1989	2	3.03	25 719	276 833	6503	70 000
1992	10	15.15	382 736	4 119 738	7459	80 290
1995	3	4.55	122 152	1 314 835	2973	32 000
1999	4	6.06	88 628	953 988	4831	52 000
2002	2	3.03	215 347	2 317 977	0	0
2006	3	4.55	232 742	2 505 209	0	0
Total	66	100	4 215 213	45 372 176	363 034	3 907 662

the Quartier International de Montréal (QIM) strengthened several segments of the network. For example, the construction of the International Civil Aviation Organization (ICAO) headquarters created a link between Place Bonaventure and the Square-Victoria Metro station. Montréal's new construction boom in the eastern portion of downtown and a new Transportation Plan that envisions capitalizing on opportunities to expand the network are good indications that the Indoor City's next growth spurt is about to begin.

The creation of an additional walkway below 1253 McGill College in 1995, which linked the two "subsystems" of the Indoor City, dramatically increased the amount of retail space accessible north of the new connection. The series of maps presented in this article demonstrates that there has been a continual increase in access to retail space over time. This growth has been tied either to major events in the city or to the construction of critical network links. Perhaps most importantly, this analysis indicates that changes in the level of access over time in the Indoor City can serve as an indicator of the performance of past and present policies. Also, it shows how these policies have had significant effects on the growth of the Indoor City, leading to major changes in the amount of retail a person can reach by walking through the Indoor City.

The power of a single link that was constructed in 1995 is clearly shown in Figure 7. The creation of this link changed the level of access to retail space in the Indoor City . This link was the product of public-private partnership that took several forms prior to the construction of the link in question. Although this link is closed after the operating hours of stores, it is an important part of the Indoor City.

4 Conclusions

The Indoor City was primarily developed by the private sector; consequently, its growth has been linked to the economic development of Montréal. However, a series of policies over the past five decades—including emphyteutic leases over new Metro stations, FAR exemptions for underground construction, and, more recently, the development of the QIM and the improvement of RÉSO signage, have also had significant effects on the pace at which the Indoor City has grown. It appears that a series of policies and events explain the exponential function of the network growth model. For instance, the network growth curve's rapid rise in the 1960s can be associated with what has been called the Quiet Revolution in Quebec, under which Jean Lesage encouraged francophone Quebecers to engage in business. Additionally, Montréal Mayor Jean Drapeau's ability to attract large international events and support for the Metro allowed the Indoor City to flourish. This was followed by a series of expansions in 1970s that accompanied the Olympic Games in 1976. The relatively stability or inactivity seen in the network growth curve during the 1980s can be explained by the hardships that the Québec economy experienced as a consequence of debt and political

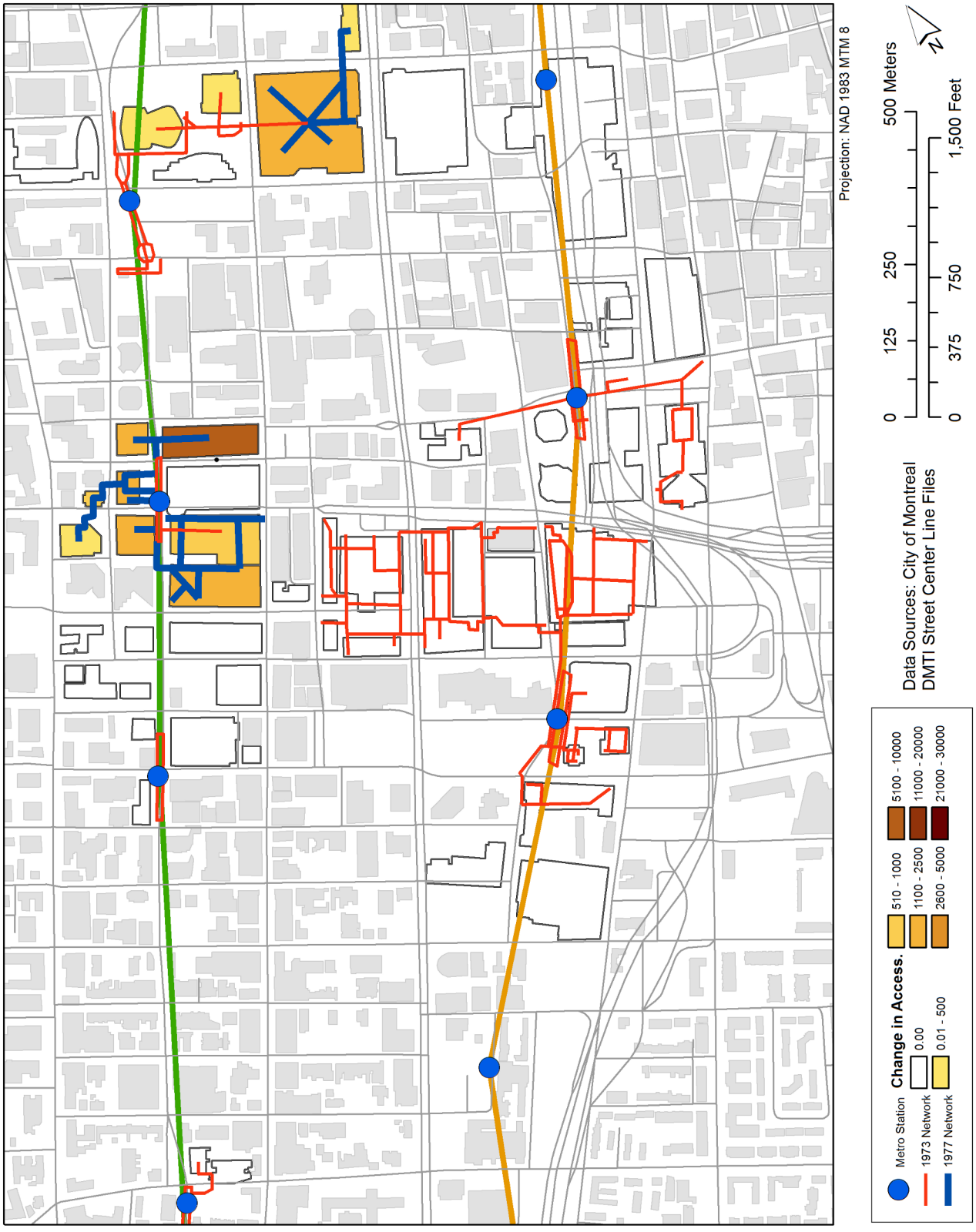

Figure 7: Change in access to retail space measured in square meters between 1992 and 1995.

change during that period. By the late 1990s, Montréal's economy had improved, in part due to the success of the Quartier International de Montréal (QIM). These events are represented on the network growth curve. In order to continue the upward trend of the network growth curve, attention must be paid to the policies set in place by the City of Montréal, and in particular to those policies related to land use and transportation, such as FAR policies.

The comparison of access levels in the Indoor City over time indicates that access to retail has increased quite consistently across the network over time. The number of buildings experiencing a change in the level of access to retail has increased over time with every link added, especially the links developed in 1995.

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