Getting into the zone: What can municipal bylaws tell us about transit-oriented development in Montreal, Quebec?

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ABSTRACT

Transit-oriented development (TOD) has been widely encouraged as a strategy to limit urban sprawl, increase urban density, reduce car dependency, and enhance neighborhood diversity. Federal and regional governments have been increasingly promoting such TOD in parallel to their light-rail-transit (LRT) projects to ensure high return on investments and foster sustainable urban transitions. We know little, however, about the extent to which municipalities are making adequate changes to existing land-use regulations to sufficiently accommodate these TOD goals. This article provides an assessment of changes in municipal plans and bylaws surrounding a new $7B LRT in Montreal, Canada that is set to open in late 2022, 6 years after its announcement. Specifically, we analyze whether changes in municipal bylaws conform with TOD plans recommended by the regional government. Through policy and spatial analysis, this research finds that only a limited number of boroughs have made sufficient bylaw changes between 2016-2022 to adequately support TOD plans aimed at implementing mixed-use zoning, increasing urban density, reducing parking minimums, and supporting affordable housing around stations. These findings suggest that some municipalities are not doing enough to maximize benefits from one of the largest public-transport investments currently being implemented in North America. These findings can aid planners and policymakers in understanding the importance of municipal zoning bylaws in an integrated transport and land-use approach. If LRT projects are to be successful in meeting sustainability goals, greater engagement with land-use regulations across multiple scales is needed to facilitate TOD.

Keywords: Transit-oriented development; light rail; land-use regulations; zoning, parking, affordable housing.

1 INTRODUCTION

In recent decades, Transit Oriented Development (TOD) has emerged as an influential planning approach across numerous cities investing in light-rail transit (LRT). In the most basic sense, TOD is a strategy that aims to integrate public-transport investments with land-use practices as a means of creating more diversified, dense, and sustainable neighborhoods in both central-urban districts and suburban settings (*1-3*). TOD projects depend on suitable and integrated land-use regulations to enable the development of denser neighborhoods and mix-land-uses (*4; 5*). We know little, however, about the extent to which municipalities are making adequate changes to existing land-use regulations and zoning codes to sufficiently accommodate TOD around new LRT stations.

Several aspects of municipal bylaws make them a useful case for examining barriers and opportunities to TOD. Zoning bylaws control physical changes to the built environment and often place significant limits on building heights, margins, and site-coverage ratios that dictate construction density (*5*). Municipalities also control the geographical distribution of different land-uses through zoning grids, thus dictating the ability to develop mixed-use zones. Additionally, parking requirements in terms of minimums and maximums fall within the jurisdiction of municipal bylaws and have an incidence on the ability of promoting active-living environments (*6; 7*), especially in TODs (*8*). Lastly, with increasing housing inequalities across North America (*9*), municipalities also hold part of the tools required to ensure the availability of high-quality, affordable, and accessible housing (*10; 11*). Given the tremendous potential that municipalities have to influence TOD implementation, greater research is needed on the critical policy groundwork needed to support TOD.

This paper analyzes the transport-land use connection in Montreal, Quebec, where TOD goals have moved to the forefront of regional urban-planning strategies. In line with the development of a new LRT system—a $7 billion investment in Montreal's transport network—policy makers are aiming to redevelop neighborhoods surrounding LRT stations in accordance with TOD goals and thus orient 60% of household growth around structural mass transit systems (*12*). Given the magnitude of these plans and investments, we provide an assessment of changes in municipal bylaws in areas surrounding the new LRT between 2016-2022 (during the LRT planning and construction phases) to determine whether these changes conform with related TOD goals. Specifically, we assess the extent to which zoning around each station complies with the TOD principals of density, mixed-land use, and decreased parking ratios while additionally assessing the implementation of affordable housing policies within these zones. The findings of this research can help in better understanding how some municipalities are leveraging investments made by higher levels of government to achieve sustainability goals, while others are lagging behind. The findings can be of use by policy makers as they plan for new LRT systems to ensure adequate land-use policies are in place for municipalities to follow to ensure the effectiveness of such investments.

2 LITERATURE REVIEW

Scholars have long recognized the role that transport plays in shaping urban-planning and development processes (*13-15*). Considering the role that car-centric transport planning has

played in perpetuating urban sprawl (*13; 16*), policy makers are increasingly working to implement planning interventions that foster a transition towards sustainable transport modes, diversify land uses, and support reasonable density (*17*). Public-transport investments, especially LRT systems, are considered critically important for facilitating these sustainable-urban transitions, but require comprehensive integration of transport plans and land-use policies (*4; 18; 19*).

To conceptualize the required land-use adaptations to foster a transition from cars towards public-transit, Calthorpe (*20)* established the term Transit Oriented development (TOD). A TOD is an urban development designed to maximize access by transit and by active travel through urban design features such as mixed land-use and walkable environments (*15*). This approach has since evolved through the influence of Cervero and Kockleman's (*21*) 3Ds concept (density, diversity and design) which identified three characteristics of the built environment that promote active transport. Indeed, the focus of a TOD as an area that is *dense* (compact housing, employment and service infrastructure), *diverse* (mixed activities and land-use forms), and that promotes thoughtful *design* (public spaces and environments adequate for walking, cycling and leisure) is now widely accepted (*3; 22; 23*). Still, such developments are dependent on the type of public transit around which they are organized. The integration of high-frequency transport service as a primary component of TOD initiatives has supported the expansion of LRT investments, with a particular emphasis on providing efficient and sustainable transit options to reduce car dependency (*14*).

Proponents of TOD often assume that the implementation of LRT will help to increase public-transport ridership, confront urban sprawl, and improve the accessibility of station neighborhoods, thus encouraging more diversified and dense land-use developments (*24*). Others have called into question the extent to which LRT is capable of impacting land-use development in line with TOD goals (*13*), especially in suburban areas where Transit Adjacent Developments (TADs) often arise instead (*25-27*). These discrepancies could be associated with the fact that a TOD approach can be considered both at the station level – through prescriptive guidelines for specific developments – or at the regional level – as a more flexible orientation for urban growth (*3*). Nevertheless, the need for greater attention to collaborative processes across local and regional actors (e.g. policy makers, planners, and transit agencies) has also been highlighted in the literature on TOD (*4; 28-30*).

While an extensive body of literature has examined the relationship between LRT and various TOD outcomes (*31; 32*), surprisingly little research has explored the role of municipal plans and bylaws in these processes. Although various planning commissions and design boards provide discretionary approval mechanisms for urban-development projects (*33*), the additional costs, delays, and uncertainties associated with the review processes can often significantly hinder or rescind development outcomes (*18*). As such, urban planners have emphasized the critical importance of rezoning to better facilitate efforts to increase housing-unit counts, decrease parking minimums, and implement related sustainable-design initiatives (*4; 7; 18*). For example, a comparative study on TOD in Seattle and San Francisco found that rezoning has a significant impact on development outcomes (or lack thereof) given the controls they place over

neighborhood development, including allowable uses, building height limits, and parking ratios (*18*).

While providing affordable housing in TOD is sometimes promoted by transport authorities (*34*), past research has highlighted pervasive issues of housing unaffordability in TODs (*35*); a reality that increases with improvements in the active living potential of the surrounding areas (*36*). Given these tensions, researchers are increasingly stressing the importance of developing concrete housing policies that help to increase the availability of affordable housing around TODs, and that ensure the accessibility of these housing options in the long-term(*37*). For LRT to achieve its sustainability goals, it is thus essential to revisit zoning ordinances around stations to provide a clear channel for inclusive TOD.

Considering the need for additional research on the role of municipal bylaw changes in the implementation of TODs, this paper contributes to the literature by analyzing station-level bylaw changes and their integration into regional TOD approaches. We will further examine the extent to which these multi-scalar dynamics incorporate issues of housing affordability.

3 CONTEXT

In 2016, the governments of Quebec and Canada conjointly announced the construction of the *Réseau Express Métropolitain* (REM) – an ambitious light-rail transit (LRT) project set to improve public-transit service for the population of over 4 million living in the Montréal region (*38*). The high-frequency LRT system will include 26 stations that span across 10 municipalities and 8 boroughs of the city of Montréal, connecting residential and industrial areas together, along with the downtown core and the airport (Figure 1). Considering the fairly low transit modal-share in the region (16%) and the sprawling population growth (*39*), this $7 billion infrastructure project offers a unique opportunity to implement complementary land-use policies to curb the unstainable growth of low-density, car-dependent suburbs.

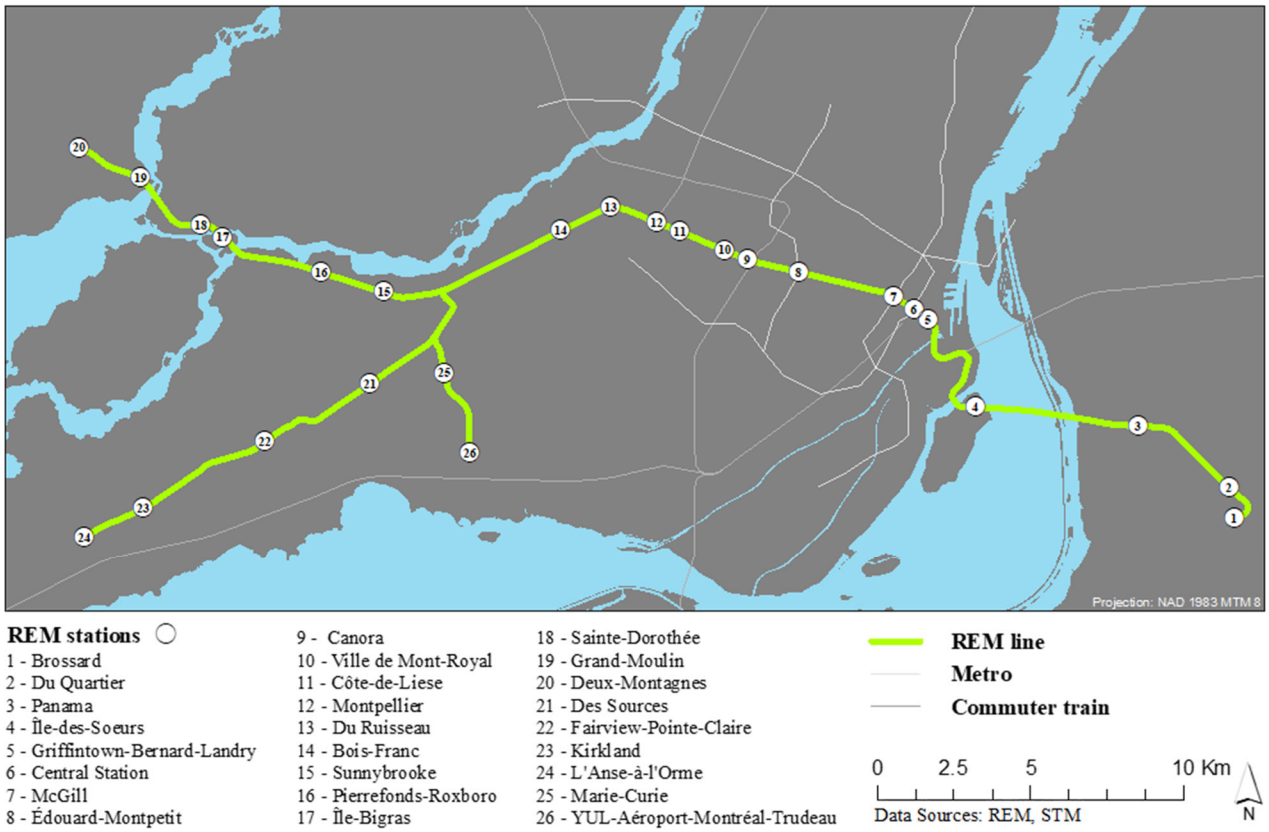

Figure 1 Detailed map of the Réseau Express Métropolitain (REM) in Montréal, Canada

In Montréal, regional land-use regulations around transit stops are overseen, planned, and finnced by the Montréal Metropolitan Community (CMM). Through the latest *Plan métropolitain d'aménagement et de développement* (PMAD) adopted in 2011, the CMM focuses on the elaboration of Transit Oriented Developments (TODs) as a means of addressing concerns regarding urban sprawl, population growth, and urban livability (*40*). One of its primary objectives is to direct 60% of all household growth around structural mass-transit systems by 2031. If implemented properly, this objective has the potential to curb urban sprawl, and generate a significant mode shift away from private cars towards public transit (*12*). The CMM's vision of a TOD focuses on the creation of quality dense living environments in pre-identified zones around the region (*41*). The regional authority established a varying minimum-density threshold for TOD zones, which are geographically defined as a 1km radius surrounding metro, train, light rail, and bus-rapid-transit stops (*40*). Other elements that are crucial to a make a TOD successful – mixed land-use, strict parking regulation and affordable housing – are formulated as suggestions instead of prescriptions.

Given that land-use regulation and zoning capabilities in the province are left for the most part to municipalities – and boroughs in the case of the city of Montréal – local governments are left with significant autonomy in the implementation process. As in a number of other cities promoting TODs, discretionary approval processes form a part of the tools available to municipalities in Quebec. These tools include Special Urban Planning Programs (SPPs), which are amendments to a municipality's master plan. These SPPs are submitted to public

consultations and approved by council to help orient development goals in a pre-determined area. While SPPs can allow changes to specific construction requirements – such as land-use designations – without necessitating modification to existing bylaws, they are at times adopted in conjunction with zoning-bylaws reforms. Notwithstanding the presence of these development-approval processes, zoning bylaws still provide the clearest and most effective pathway for land-use changes.

4 METHODOLOGY

We conducted a comprehensive policy analysis of changes to municipal bylaws following the announcement of the construction of the REM in 2016 to evaluate the extent to which these changes correspond to regional TOD-related plans. All but one of the 26 stations were considered in the analysis (the *YUL-Aéroport-Montréal-Trudeau* station was removed due to its sole purpose of serving the airport and not local communities). Municipalities and boroughs of interest were identified using a 1-kilometer airline buffer around all 25 REM stations (Table 1). For each of the 17 municipalities and boroughs identified (Table 1), minutes of every municipal council meeting that took place between January 2016 and June 2022 as well as the associated amendments annexes were consulted and analyzed using a keyword approach. Additionally, zoning bylaws in effect at the announcement of the REM in 2016 were compared to the latest versions adopted. When applicable, Special Urban Planning Programs (SPPs) adopted for a specific TOD were analyzed. Whenever information was not publicly available online, municipal planning departments were contacted through an access-to-information request. All retrieved zoning changes and mentions of the REM were compiled in a database along with the date of the corresponding meeting. As the goal of this research is to determine zoning-by-law changes that resulted from the arrival of the REM, zoning changes outside of the 1-kilometer buffer zones around each station were excluded. In addition, in accordance with TOD characteristics highlighted in the literature, only changes pertaining to land-use density, land-use mix, transport infrastructure, and housing affordability were kept. Bylaw changes were summarized at the station level given that a few stations span multiple municipalities or boroughs in their 1-kilometer buffer.

Current geographic land-use data of the Montréal CMA was also retrieved from the CMM and linked to each station using the 1-kilometer buffers. We calculated the proportion of each usage of interest as a ratio of total land cover in the 1-kilometer buffer of a given station, with a constructable land category being derived by aggregating all vacant and parking-lot zoning. All public utilities usage (e.g., roads, railways, electric plants) were left in the calculations but not considered in the analysis, as they are either not realistically modifiable in the timescale considered or are outside of municipal jurisdictions.

Lastly, to compare differential outcomes in term of municipal bylaw changes and planning approach to the land around the upcoming LRT stations, a case study approach is used. Two contrasting case studies are outlined to exemplify variability in the implementation of a TOD approach across stations.

Table 1 Contextual information of REM stations

Stations	Municipality(ies) / Borough(s)	1 km buffer population density (person /Km^2)[1]
Downtown stations		
Central Station	Ville-Marie	6,976.79
Grinffintown-Bernard-Landry	Le Sud Ouest	6,750.46
	Ville-Marie	
McGill	Ville-Marie	6,788.15
Urban Stations		
Bois-Franc	Saint-Laurent	6,040.77
Canora	Côte-des-Neiges-Notre-Dame-de-Grâce	6,976.07
	Ville-de-Mont-Royal	
Côte-de-Liesse	Saint-Laurent	3,686.99
Du Ruisseau	Saint-Laurent	7,357.92
	Ahuntsic-Cartierville	
Édouard-Montpetit	Côte-des-Neiges-Notre-Dame-de-Grâce	4,167.33
	Outremont	
Montpellier	Saint-Laurent	5,794.63
Ville de Mont-Royal	Ville-de-Mont-Royal	3,972.14
Suburban stations		
Anse-à-l'orme	Saint-Anne-de-Bellevue	303.66
	Baie-d'Urfé	
Brossard	Brossard	403.5
Des Sources	Pointe-Claire	372.46
Deux-Montagnes	Deux-Montagnes	731.33
Du Quartier	Brossard	510.71
Fairview-Pointe-Claire	Pointe-Claire	1,118.49
	Kirkland	
Grand-Moulin	Deux-Montagnes	1,811.11
Île-Bigras	Laval	1,392.95
Île-des-Soeurs	Verdun	2,734.68
Kirkland	Kirkland	1,757.36
Marie-Curie	Saint-Laurent	67.31
Panama	Brossard	2,931.43
Pierrefonds-Roxboro	Pierrefonds-Roxboro	3,530.59
Sainte-Dorothée	Laval	931.57
Sunnybrooke	Pierrefonds-Roxboro	3,668.42
	Dollard-des-Ormeaux	
YUL-Aéroport-Montréal-Trudeau[2]	Dorval	85.95

[1]Data source: Statistic Canada

5. RESULTS

Through a comprehensive analysis of urban land-use plans and zoning changes from 2016-2022 (Table 2), we conceptualized four categories to differentiate stations in terms of their engagement with TOD-related land-use regulations: (1) *Pre-existing TOD stations,* which already benefit from dense, mixed-use zoning; (2) *Developing TOD stations*, which have implemented significant bylaw changes in accordance to TOD principals; (3) *Non-TOD stations with changes,* where some zoning changes have been implemented, but they do not directly align with TOD principals; and (4) *Non-TOD stations without changes*, where no or minimal bylaw modifications have been implemented (Figure 2).

Table 2 Bylaw changes pertaining to TOD characteristics separated by station classifications

Modifications	**Pre-Existing TOD** (n=4)	**Developing TOD** (n=4)	**Non-TOD, with changes** (n=6)	**Non-TOD, no changes** (n=11)
Density				
General orientations				
Develop new residential areas	1	4	3	0
On empty land	1	1	2	0
Through Redevelopment	1	4	2	0
Specific bylaw changes				
Allows Multi-Family Housing	1	4	1	0
Floor Area Ratio				
Increased	0	3	2	0
Decreased	0	1	2	0
Building Margins				
Increased	1	1	4	0
Decreased	0	1	0	0
Maximum building height				
Increased	1	4	4	0
Decreased	0	1	2	0
Mixity				
Rezoned to mixed land-use	0	4	3	0
Develop new commercial areas	0	2	3	0
Develop new offices / industries	0	1	1	0
Parking				
Parking minimums				
Removed	2	3	0	1
Decreased	1	4	2	0
Parking maximums				
Implemented	1	1	0	0
Decreased	1	1	1	1
Surface Parking maximum				
Implemented	1	2	0	1
Decreased	0	1	0	0
Affordable housing	0	1	1	2

Figure 2 REM stations classified by TOD categorizations

The most common TOD component addressed in the bylaw changes was densification, with changes being made to maximum building height, margins, and floor-area ratios. Changes relating to diversification were also made for some stations primarily through the rezoning of vacant, industrial and low-density areas to mixed-use. For parking requirements, changes were made both on parking minimums and parking maximums. Lastly, in term of affordable housing, the By-law for a Diverse Metropolis adopted by the city of Montréal in 2021 – which requires projects that increase the constructable residential area to include from 10 to 20 % of affordable housing (*42*) – is the only bylaw that had incidence on housing affordability around the new REM stations. This bylaw is only applicable to the 12 stations falling partially or completely under the jurisdiction of Montréal boroughs, with solely 4 having already been impacted by it in their development. To better understand the distribution of these changes across the station categorization, changes made in each category will be presented individually with case studies being added for developing TODs and non-TOD stations. The average land-use cover calculated for each station category (Table 3) will also be discussed for each category to contextualize differences.

Table 3 Land-use distribution around LRT stations separated by station classifications

Land Use	**Pre-existing TOD** (n=4)	**Developing TOD** (n=4)	**Non-TOD, with changes** (n=6)	**Non-TOD, no changes** (n=11)
Residential				
Low-density (Single dwelling)	5.72%	22.17%	17.39%	25.93%
Medium Density (2-4 dwellings)	3.60%	1.80%	2.06%	4.39%
High Density (5+ Dwellings)	11.10%	4.90%	5.97%	6.23%
Employment				
Industrial Zone	3.26%	0.49%	13.79%	3.80%
Commercial Zone	7.64%	13.44%	11.66%	6.78%
Offices & Institutions	30.38%	7.56%	6.88%	6.33%
Green Spaces	2.66%	3.31%	5.11%	3.15%
Constructable land	6.36%	8.69%	13.54%	11.46%

5.1 Pre-Existing TODs

Four stations were categorized as pre-existing TODs, all of which are located in the central part of the city. Being near metro stations, these TODs are already adapted for transit, with highly dense and mixed land-use. As such, limited bylaw changes were adopted in these areas. Only one station, which was the only one that is not already a Metro stop, saw significant bylaw changes in term of density and land-use diversity. Maximum building heights for undeveloped lots were increased, with zoning being changed to mixed use and industrial zones being rezoned as greenspaces. In term of parking requirements, parking minimums were removed in some zones for one station, and across the TOD area for another. A third station saw the implementation of parking maximums in zones where they were not existent and decreased them where they were already in place. None of the stations directly integrated affordable housing.

5.2 Developing TODs

Four stations were categorized as developing TODs all of which are in suburban settings. These stations have low-to-medium population densities – 1,996.98 person/Km^2 across all four – with the lowest proportions of high-density residential areas (4.90%) and a high portion of detached single-family dwellings (22.17%). They are also characterized by the highest proportion of land allocated to commercial land-use (13.44%) compared to other station categories.

All four stations undertook important changes in their bylaws to favorize densification. This included rezoning former park-and-ride lots and commercial areas to high density residential and mixed uses in three stations and converting low-density residential areas to higher-density and mixed uses in the fourth one. Reduced margins between buildings, increased floor-area ratio, and increased maximum height were implemented to favorize such change. Despite clear intents to densify the surrounding areas of these stations, densification was for the most part done with a care for the existing built environment and architectural heritage, especially with regards to height gradations. This was apparent in the retroactive reduction of maximum heights for two stations to better integrate with the existing built environment. Mixed uses were carried out in different ways depending on the TOD. All stations implemented commercial areas within new residential neighborhoods using vertical mixed-use (i.e., within the same building), with some further diversifying through the development of offices and schools. Lastly, all four stations implemented more restrictive parking requirements. Parking minimums were decreased in some zones for all four stations and completely removed in other zones for three stations. Additionally, two stations implemented maximum ratios for surface parking at 20% while another one reduced the existing maximum from 20% to 5%. Lastly, only one developing TOD incorporated plans for affordable housing. To exemplify the implementation of these changes one of the developing TOD – *Île-des-Soeurs* – is presented as a case study.

5.2.1 Case Study: Île-des-Soeurs

Île-des-Soeurs is a middle-to-high-income neighborhood in the Montréal borough of Verdun. The 1-kilometer buffer surrounding the upcoming station (Figure 3) has a population density of 2,734.68 people/km^2 and is made up of a combination of mixed-density residential areas, car-oriented commercial uses, and office buildings. While an important portion of previously commercial and industrial areas were rezoned as mixed or residential zones, a significant proportion of the area neighboring the station to the south was rezoned solely for commercial

and office usages, albeit at higher densities (Figure 4).

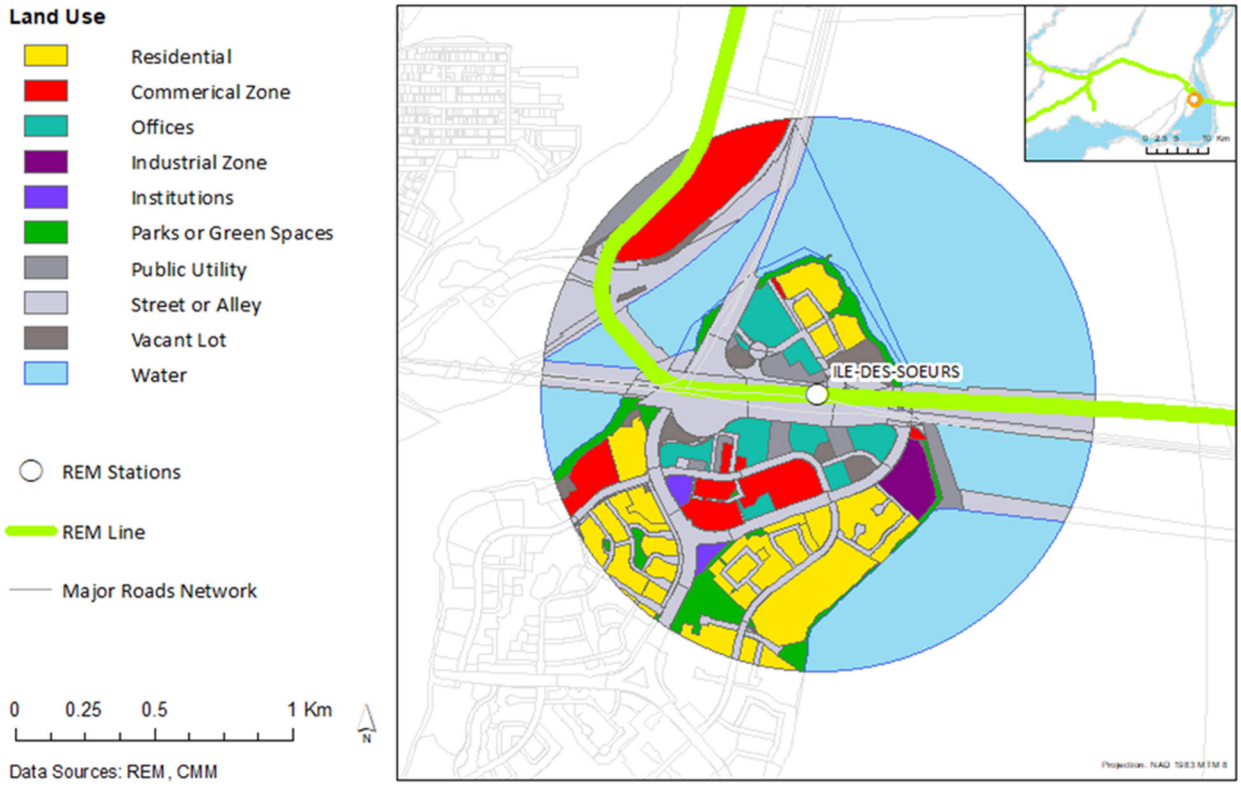

Figure 3 Land-use in the Île-des-Soeurs TOD area

Through the Île-des-Soeurs SPP adopted in 2020, Verdun defined and separated the TOD into six sections, each with their specific zoning requirements. This approach allows the borough to have discretionary control over each project, as real-estate developers are forced to go through a SCAOPI process to receive approval for their project. Notwithstanding those discretionary processes, changes were also made to the zoning grids in accordance with the orientations in the SPP. Additionally, the removal of the notion of architectural integration with the existing built environment in the SPP allowed for other changes to take place, such as the development of multiple high-density condo towers in a previously low-density area (Figure 4). Nevertheless, visual appeal and the creation of a pleasant living environment remains foremost in all six sections. Indeed, through its SPP, the borough incentivizes green and accessible roofs while also adding requirements for substantial proportions of every constructed lot to be dedicated to vegetation. The SPP also promotes a strategic gradation of heights and volumes of buildings that prevent the barrier effect and preserves views of the Saint-Lawrence River.

a) Pointe-Nord sector (North of REM Station) b) Commercial area (South of REM Station)

Figure 4 Pictures of the Île-des-Soeurs TOD area

In term of transport-related changes, access to the REM is foremost in the SPP, with emphasis also placed on active-travel infrastructure. The borough simultaneously limited car accessibility. Indeed, parking minimums were removed for every residential or mixed-use building and substantially reduced for commercial ones. Additionally, a bylaw caping the allowable proportion of parking spaces at 5% (as opposed to 20%) for the rest of the borough was adopted.

Lastly, both areas bordering the station to the North and South have been identified by the city of Montreal as affordable housing zones through the By-law for a Diverse Metropolis, making it the only developing TOD with plans for affordable housing. However, the latest rezoning of the area south of the station for commercial and offices uses reveals that the implementation of the affordable housing in this zone is not yet certain.

5.3 Non-TODs with changes

Six stations were characterized as non-TOD with changes – 5 in suburban settings and one in an urban setting. These stations have a wide range of densities (3,206.09 people per Km^2 across all six) and are characterized by having the highest percentage of industrial (13.79%) and available land (13.54%), while commercial zones represent 11.66% of the land use.

While some stations benefited from increased floor-area ratios, increased maximum building height, decreased parking minimum, and reduced margins between houses, these changes were done sparingly without the englobing vision that is crucial to create a TOD. Additionally, suburban opposition to densification (manifested through changes in municipal governments in Fall 2021) meant that previous plans for TOD were discarded for one station. Lastly, one station was limited in its ability to implement a TOD due to its surrounding area being already fully developed with mostly low-density residential uses. To exemplify the dynamics at play behind non-TOD stations that implemented bylaw changes, a case study is presented for the *Anse-à-l'Orme* station.

5.3.1 Case study: Anse-à-L'Orme

Anse-à-l'Orme station is located at the intersection of two municipalities' jurisdictions, Baie-d'Urfé and Sainte-Anne-de-Bellevue, with the former being located south of the highway and the later to north of it (Figure 6). This station is characterized by its high share of developable land – the highest of all stations located on the Island of Montréal – and its low population density of 303.66 people/Km^2 – making it second to last in the entire REM network.

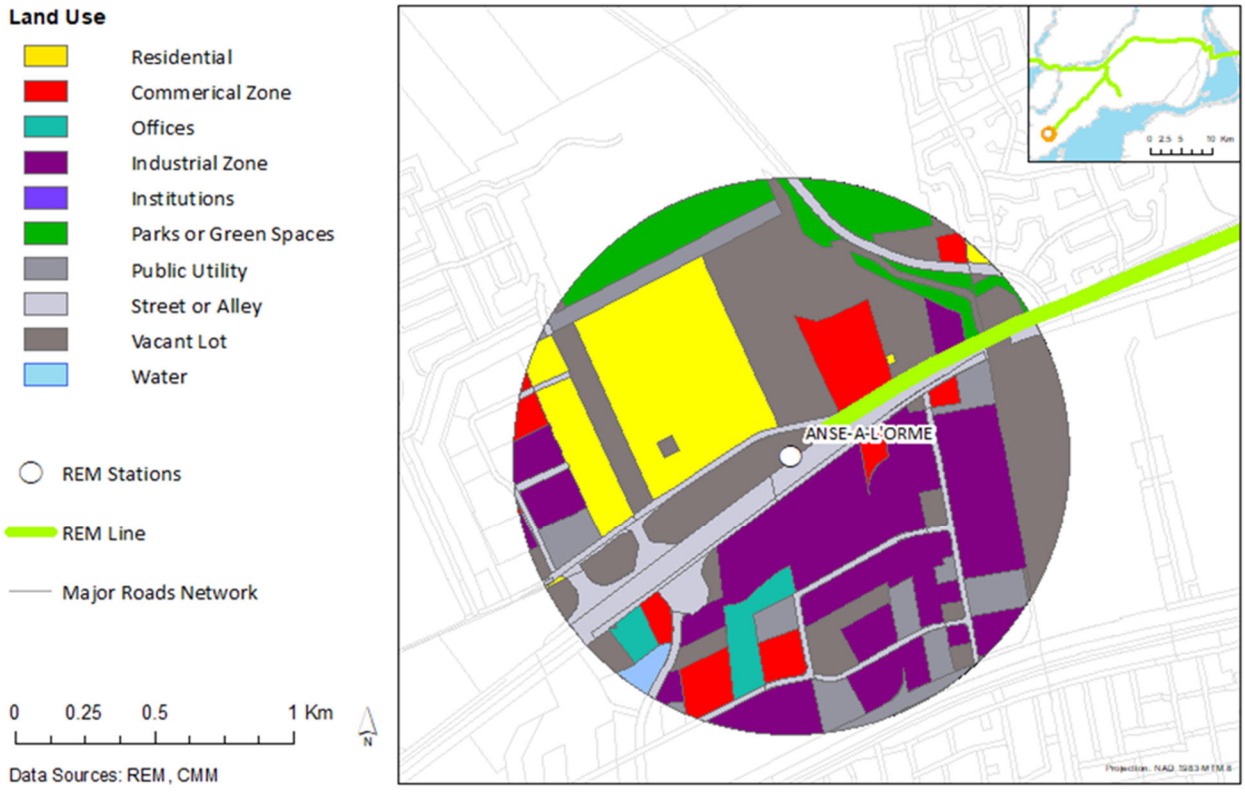

Figure 5 Land-use in a 1-km buffer around Anse-à-l'Orme station

Baie d'Urfé – whose half of the buffer area is mostly occupied by industrial land use (Figures 6) – did not make any significant changes to their bylaws. Given the maximum land coverage requirements in their zoning bylaw, no further construction is currently allowed. In contrast, Sainte-Anne-de-Bellevue's territory encompassed by the buffer zone is almost entirely made up of vacant land (Figures 6). Before changing their bylaws, the municipality produced an extensive SPP for this area. The document focuses primarily on the preservation of green spaces, as well as the extension of current commercial and industrial uses. Accordingly, the municipality rezoned most of the empty land for commercial or industrial use, with a maximum building height of 4 and a maximum site-coverage ratio of 0.25. While the SPP encompassed the implementation of diverse housing types, the municipality only zoned for low-density, detached single-family houses with a maximum density of 15 dwellings/ha. In addition, underdeveloped residential areas were rezoned as protected natural spaces, further preventing developments in the sector. Finally, minimal bylaws changes pertaining to the layout of parking lots were made while no regulations were implemented to guarantee affordable housing.

a) Empty land in Sainte-Anne-de-Bellevue (North of REM Station) b) Industrial zone in Baie-d'Urfé (South of REM Station)

Figure 6 Pictures of Anse-à-l'Orme station's surroundings

5.4 Non-TODs without changes

11 stations were categorized as non-TOD stations without bylaw changes. These stations are characterized by no or minimal changes within a 1-kilometer buffer of the REM stations, with only one station, Canora, benefiting from slightly stricter parking requirements. These stations highlighted the largest range in population density and were predominantly dominated by low-density residential areas at 25.93% of the total land-use – the highest proportion across all four classifications. The lack of bylaw changes could not be solely attributed to a lack of developable land, as non-TOD stations had the second highest total available land percentage out of all four categories (at 11.46%).

6. DISCUSSION

Since the announcement of the construction of the *Réseau Express Métropolitain* in 2016, transit-oriented development has moved to the forefront of Montreal's urban-planning agenda, with the intention of fundamentally reorienting household growth around mass-transit stations to allow for the development of more sustainable urban environments. Notwithstanding policy makers' positive intentions to promote TOD, our results show that, six years following the announcement of the REM, there has been limited engagement with the land-use regulations required to support TOD goals on density, diversity, and parking ratios, and even less engagement with related affordable-housing objectives. Indeed, our station-level analysis of municipal bylaw changes underscores a discordance between the regional TOD approach of the CMM and the local reality on the ground.

Proponents of TOD have long advocated for the integration of *high-density* and *diversified development* around transit nodes (*20; 22; 23*), making these goals an important aspect of our comparative analysis. While the four pre-existing TOD stations already benefit from suitable bylaws, our analysis show that some boroughs have worked to rezone underdeveloped areas to allow for greater density and mixed-uses, including the addition of greenspaces. These changes illustrate the importance of rezoning considerations, even in areas with land-use regulations that are already conducive to TOD, to allow for the improvement of underutilized areas. The four developing TOD stations show further signs of promise, where

boroughs have initiated significant bylaw changes, including the rezoning of commercial, industrial, and parking areas to allow for more compact, diversified developments and the construction of adequate multi-family housing. Some of these boroughs have taken further steps to carefully design new station areas in ways that integrate with existing built environment, respect architectural heritage, and support the construction of schools.

On the other hand, bylaws changes have been limited across the 17 non-TOD stations, despite having the highest proportions of constructable land (i.e., vacant and parking lots). Low-density developments remain (for the most part) the norm in most of these areas and particularly in suburban cases. Around some of these stations, the minimal development that occurred was not necessarily a result of new zoning bylaws but is rather likely attributable to developers wanting to take advantage of the increased value and accessibility of their lots. These findings highlight the fact that intentional densification and diversification around new transit station, while less prevalent in areas with fully developed land-covers, is not primarily dependent on available land, but rather on a variety localized factors, including issues of political will and suburban resistance (*13; 27; 30*). The Anse-à-l'Orme case study exemplifies this tension as, while regional planning regulations would require the elaboration of denser residential area, only minor zoning changes that incorporate low-density commercial and industrial developments and the construction of detached single-family homes have been made. That these zoning changes run contrary to the borough's SPP demonstrates the need for careful attention to municipal bylaws in the assessment of TOD implementation. These findings further support the importance of regional planning in the elaboration of zoning bylaws to avoid the development of TADs in the place of TODs (*26*).

Our study context further demonstrates the importance of accounting for bylaw changes pertaining to *parking ratios* in TOD studies. We observed that several pre-existing TOD stations have managed to maximize benefits from LRT investments by revisiting parking minimums and maximums around future stations. The developing TOD stations—and especially the Île-des-Soeurs case study — underscore the value of careful modifications to parking regulations, which not only reduce parking minimums, but also work to better restrict parking to underground areas, allowing for the development of more walkable, bikable, and liveable urban spaces. That changes to parking regulations are almost absent surrounding 17 non-TOD stations is perhaps unsurprising, considering that researchers have documented an enormous amount suburban resistance to policies that limit the mobility privileges afforded to car drivers in a number of North-American contexts (*43*). Yet, the high level of political inertia surrounding parking regulations in these areas calls in question regional TOD plans given that parking ratios have a direct impact on available space for development, active travel behaviors, and the livability of station areas (*6-8*).

Ensuring the availability of adequate *affordable housing*, both around LRT stations and beyond, represents a foremost challenge in Greater Montreal. However, our analysis shows that only four stations in two boroughs have undergone changes to allocate affordable-housing units in new development projects. In these cases, affordable housing provisions have only been assured because of a city-wide policy — the By-law for a Diverse Metropolis — pertaining to new development project. This municipal bylaw only applies to areas located with the city of

Montreal, meaning that over half of the LRT stations in our analysis are not subjected to affordable-housing policies. Furthermore, the By-law for a Diverse Metropolis only pertains to new development projects, meaning that there is nothing to protect current residents located around new LRT stations from potential rental-price increases and neighborhood displacement, even if such outcomes have been mentioned as a potential aftereffect of TODs (*44*). Given that TODs have at times been linked with concerns about housing affordability (*35; 36*), we argue that these dynamics merit much greater emphasis within TOD strategies. *Diversity*, after all, should not simply refer to the intermixing of urban forms for business and community activities, but rather fundamentally applies to the characteristics of communities themselves. New public-transit investments are not only made to allow for added densification around developments, but fundamentally to provide adequate services to communities residing in the station areas and beyond. Greater attention is thus needed to housing affordability, and to policies that ensure it, otherwise LRT developments are at risk of becoming high-income enclaves and further widening inequities in public-transit accessibility.

Collectively, our analysis reveals that while some Montreal boroughs have started making adjustments to their bylaws to facilitate TOD around LRT stations, the depth and scope of these changes may not be sufficient to support the targeted sustainable urban transitions that LRT is built for. Our study is limited to the early phases of LRT implementation, and thus was not able to measure long-term development outcomes. A follow-up study should thus be conducted a few years after the opening of the LRT as part of a longitudinal study to detect the progression of zoning changes in line with TOD orientations. Given that the LRT system is still in construction in Greater Montreal, municipalities that have yet to modify their zoning bylaws to promote TODs could very well do so after the opening. That being said, major differences and inconsistencies were found in regulations implemented by some municipalities, indicating that a lack of appropriate land-use policies could remain a major barrier to TOD across several boroughs. Our analysis therefore emphasizes that while flexibility in TOD implementation has been discussed as beneficial for adapted developments (*3*), additional guidance and regulations at the regional level may be necessary to adequately support TOD goals. Regional affordable housing policies – not just municipal ones – are also crucial to ensure the provision of affordable housing and minimize population displacement in TODs. Analyzing TOD during the construction phase of new LRT investments provides a critical opportunity to carefully assess development processes, not only to monitor the construction of physical infrastructure, but also to address potential shortfalls in the critical policy groundwork needed to adequately support sustainable-development goals.

7. CONCLUSION

Policy makers in cities such as Montreal have been granted an unprecedented opportunity to use LRT investments as a leverage to transform their sprawling cities into more diverse and livable environments through TOD. Yet, major barriers to TOD remain, from the insufficient integration of transport and land-use considerations to inadequate policy infrastructure (*13; 18*). While our study is limited to the construction phase of a new LRT investment in Greater Montreal, our findings suggest that only a limited number of boroughs in the region have made sufficient bylaw changes to adequately support TOD plans aimed at implementing mixed-use zoning,

increasing urban density, reducing parking minimums, and augmenting affordable housing. These findings suggest that local policy makers may not be doing enough to benefit from one the largest public-transport investments currently being implemented in North America. Our research provides evidence of the need for more attention to zoning bylaws as a part of studies aimed at supporting transit-oriented development. If TOD projects are to be successful in meeting the goals of sustainable-urban development, greater understanding of land-use regulations is needed to support the groundwork of TOD and ensure the maximization of societal benefits from public-transit investments.

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9. AUTHORS CONTRIBUTION

The authors confirm contribution to the paper as follows: Study conception and design: Soliz, Rodrigue & El-Geneidy; Data collection: Soliz, Rodrigue, Bernard, Duffy & El-Geneidy; Analysis and interpretation of results: Soliz, Rodrigue, Bernard, Duffy & El-Geneidy; Draft manuscript preparation: Soliz, Rodrigue, Bernard, Duffy & El-Geneidy. All authors reviewed the results and approved the final version of the manuscript.

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