TRANSIT-ORIENTED DEVELOPMENT: CANADIAN CASE STUDIES

Introduction

As Canada becomes increasingly urbanized, cities and metropolitan regions are faced with the challenge of maintaining and enhancing livability and sustainability in the face of often rapid population growth. One of the most important aspects of maintaining livability in urban development is to integrate land use and transportation. Land use mix and density affect the viability of mass transit and other transportation systems and, on the other hand, the availability of transit affects land use and density patterns. The concept of focusing compact, mixed-use development around transit nodes has emerged as a key strategy to manage the effects of growth, create more livable communities and reduce automobile use, thus reducing greenhouse gas emissions, congestion and costly road expansion.

Many older, more established neighbourhoods and urban centres developed before WWII demonstrate successful integration of transportation infrastructure and services into community design. These places, characterized by fine-grained pedestrian-oriented routes, high-quality urban design, a range of land uses and parcel sizes, a mix of residential densities and, most important, well-established transit nodes, support a range of efficient and reliable transportation options. This form of development, often referred to as Transit-Oriented Development (TOD),

LEARNING OBJECTIVES

By reading this article you will learn about:

- what defines a TOD;
- what design features should be included in a TOD;
- the benefits of incorporating these TOD features, including achieving LEED ND points and meeting municipal objectives for sustainable growth management and vibrant, liveable, walkable neighbourhoods;
- what are some of the challenges for architects, developers and municipalities;
- how can those challenges be overcome;
- what municipal policies and initiatives facilitated the development of the 10 TOD case studies described in the article;
- what motivated the occupants and developers to choose these locations;
- how profitable were these TODs for the developers and how affordable were they for the occupants; and
- what are some characteristics of occupants who were attracted to these developments.

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is now experiencing a resurgence in cities across Canada, the US and elsewhere. TODs are showing promise as one method to boost transit use and contain urban sprawl while contributing to healthy, walkable neighbourhoods and vibrant local economies.

Several recent examples of TODs in Canada provide lessons for the creation of future ones. This article features the results of a CMHC study examining 10 recent projects in Canada. These case studies examine the factors contributing to successful TOD projects and the challenges faced by both private developers and public agencies in carrying them out. The study began with a literature review on TOD which is incorporated into this article to provide some background information.

What is TOD?

Peter Calthorpe, an urban planner and one of the pioneering advocates of this approach to development, coined the name "transit-oriented development" to describe "…moderate and high density housing, along with complementary public uses, jobs, retail and services…concentrated in mixed-use developments at strategic points along the regional transit systems." (Calthorpe, 1993). TODs are located within an easy walk (10 minutes or 800 m) of a transit station or major stop in environments that encourage walking (Figure 1).

TODs can occur at a variety of scales. They can be both large-scale, master-planned projects, or incremental redevelopment on a parcel by parcel basis around an existing transit stop or node. The CMHC case studies look at a range of project types and scales as well as transit types.

Residential development around transit nodes can be served by a number of transit types including:

- Rapid/express bus;
- Light rail transit (at grade);
- Grade separated rail, underground (subway, metro) and elevated (SkyTrain);
- Commuter rail; and
- Commuter ferry.

Figure 1 – Collingwood Village in Vancouver is one of the TOD case studies described later. The SkyTrain line is shown in yellow with the station in the upper left. Lower building forms act as transitions adjacent to the existing neighbourhood, while the highest density is concentrated closest to the SkyTrain station.

Figure 2 – Transit-supportive mixed-use near the SeaBus terminal adjacent to Time, North Vancouver

TOD Concepts and Design Principles

The key to the TOD concept is that development around transit nodes should be pedestrian-oriented, and characterized by medium- to high-densities with a range of mixed-uses including residential, commercial and institutional (Figure 2). TODs should be designed around well-linked, high-quality public open spaces and adjacent to a well-designed transit station (Figure 3).

Regional-scale considerations determine the location of transit corridors and stations. Development around transit stations involves specific site-scale considerations. The design and mix of land uses must concentrate activities adjacent to transit stations to maximize transit ridership and offer attractions, such as convenient retail and services for transit riders. Transit stations should be located within a reasonable distance of residences to promote walking and cycling. Street design should be amenable to cycling (Dunphy, 2004).

Transit-oriented development generally requires both public investment (in the transit infrastructure) and private investment (in the form of development around the transit node). Therefore, to be successful, transit nodes need to be planned with co-operation between the public (transit agency, regional and municipal government) and private sectors. Ideally the transit station should be designed to be a fully integrated part of the community. "For metropolitan areas, developing around transit requires an underlying regional strategy focused on clustering housing and employment and on linking development nodes with transit." (Dunphy, 2004).

The success of TOD depends on adhering to a number of key design principles. The City of Calgary's TOD guidelines (2004) identify the following key TOD components:

- Get the land use right.
- Promote high density development.
- Create convenient pedestrian connections.
- Ensure good urban design.
- Create compact development patterns.
- Manage parking.
- Make each station a "place".

Figure 3 – High-quality urban design, public open spaces and pedestrian networks throughout Port Credit Village, Mississauga.

Dunphy identifies four essential components: Distance, Density, Design, and Diversity, which we shall examine in more detail.

Distance

In most projects, the TOD is contained within a "walk shed", which is the area defined by the distance a person is generally willing to walk (five to ten minutes or 400 to 800 m distance) from the transit station (Figure 4). "Transit riders start and end their journeys as pedestrians." (City of Calgary, 2004). TOD really means pedestrian-oriented development around a transit node. For all trips made to Toronto-area rapid transit stations, 56% of passengers walk to access the station, 40% use TTC buses and streetcars and only 4% arrive as auto passengers (City of Toronto, 2002). However, it should also be noted that some TODs have successfully developed by providing "park and ride" services where transit users drive and park at their station of origin. Enns (2004) compared the theoretical and actual 5 and 10 minute walk sheds in Port Moody, BC and demonstrated a significant discrepancy between theoretical and actual walking distances. This discrepancy is directly attributed to street patterns and the permeability of the urban environment.

Density

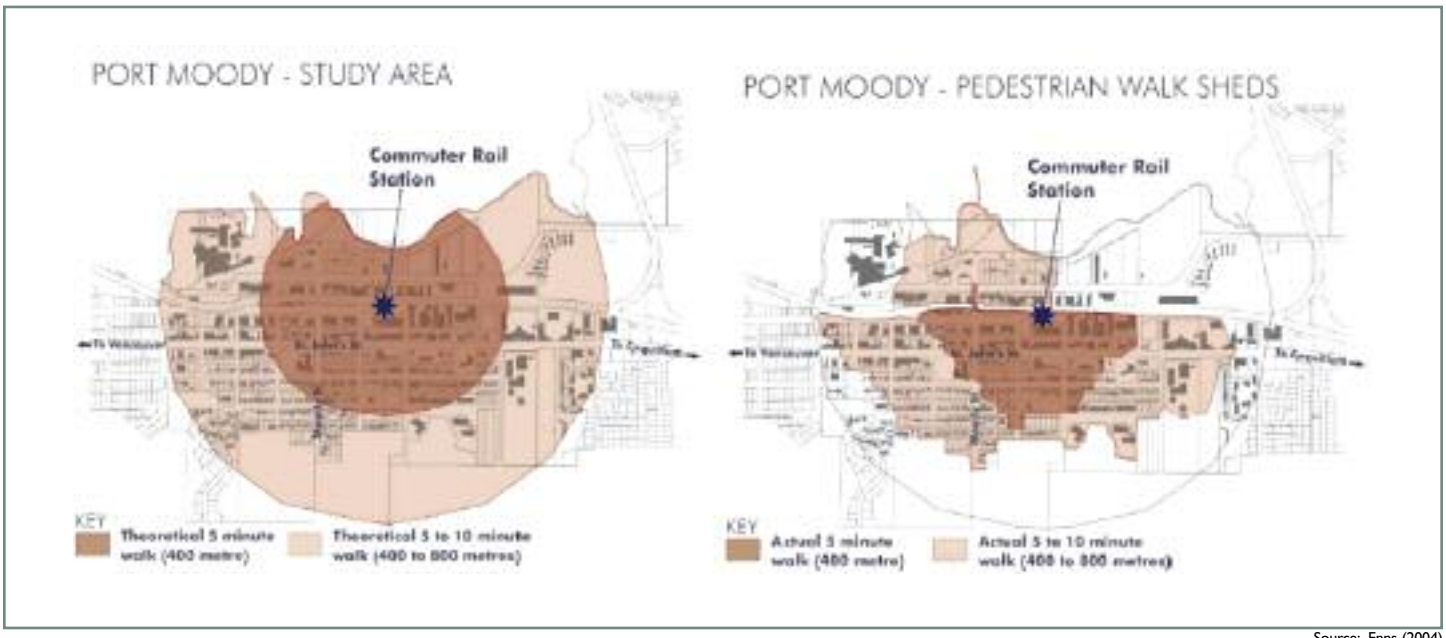
There is a clear and demonstrated relationship between how much people use transit and population and employment densities. Densities required to support different forms of transit include:

- Bus (minimum service, 20 buses/day): 4 units per acre (upa) or 10 units per hectare (uph);
- Bus (intermediate service, 40 buses/day): 7 upa (17 uph);
- Bus (frequent service, 120 buses/day): 15 upa (37 uph);
- Light rail: 9 upa (22 uph);
- Rapid rail: 12 upa (30 uph) (Pushkarev and Zupan, 1982).

The highest and densest buildings should be nearest to the transit station. A gradation of heights and densities permits a higher concentration of occupants near the station and a decrease in concentration where the development abuts the existing community, which may be lower in scale and density.

Design

TODs are increasingly called "Transit Villages" due to their similarity to older village cores, where uses and facilities are diverse and clustered together, and emphasis is placed on creating a pedestrian-friendly public realm (streets, sidewalks, open space, circulation, etc.). Indeed, exemplary new transit villages give an air of a pleasant, human-scaled, and liveable environment much like older villages.



Source: Enns (2004)

Figure 4 – Comparison of theoretical 5 minute walk to actual 5 minute walk

Because transit users are usually pedestrians, creating a pedestrian-friendly environment around the transit station is essential to the success of a TOD. "Placing local services, retail and parks close to transit reinforces the opportunity to walk or bike for many errands and combining trips to transit with other trips" (Calthorpe, 1993). A TOD should include the following features:

- a high quality public realm with interconnected public open spaces and wide sidewalks with attractive streetscaping, such as street trees, furniture, banners and lighting
- buildings that are attractive and easily reached on foot, having a "presence" at ground level with multiple entry points, a predominance of windows rather than walls, human-scaled signage, awnings, and oriented towards the street, rather than towards parking lots
- a mix of land uses in a setting that people enjoy using and in which they want to spend time
- place-making around transit stops, stations, and other transit facilities, supported by development around these facilities and easy, seamless access to transit for pedestrians and cyclists
- features that minimize walking distances, such as those which maximize pedestrian and bicycle connectivity (e.g. smaller block lengths, interconnected streets, paths through public open space, etc.)
- architectural variety and interest
- parking that is below ground, in rear lots behind buildings (Figure 5), curbside or in multi-level garages

Figure 5 – Some surface parking in an interior courtyard, hidden from the street at the Vento building, in The Bridges, Calgary.

Diversity (of land use)

Residential, commercial, institutional and employment uses all contribute to the viability of transit and TOD. Concentrating these uses around the transit stop/station makes transit and walking more convenient and safer, and provides attractions for transit riders, such as convenient retail and services and the opportunity to combine trips to transit with other trips. Ideally, TODs should support transit use throughout the day by combining nighttime uses, such as homes and restaurants, with daytime uses, such as offices and shopping. This creates synergies by doubling the use of parking and increasing the number of potential users of shops and restaurants. It also helps place "eyes on the street" around the clock. Auto-oriented land uses, such as large format retail and auto dealerships should be discouraged (City of Toronto, 2002).

Parking Policy

The tendency to bundle parking with the rent or sale price of residential units encourages residents to own and therefore use their vehicles more. Some municipalities allow and encourage developers to market residential units without associated parking spaces, allowing residents to determine and directly pay for their own parking needs.

Many cities lower their minimum parking requirements for intensification and TOD projects, as demonstrated in the case studies described below. As municipalities implement TODs, they are learning more about the parking that is needed. Earlier phases of large projects may be required to supply more parking per unit or per square meter than later phases, when evidence of reduced demand for parking induces the municipality to reduce its requirements.

Mixed-use developments can take advantage of shared parking arrangements, where daily parking for office and retail uses can be used at night by residents. To support a pedestrian-friendly environment, parking should be located below ground, in multi-level garages, behind buildings or at the curbside instead of in large surface parking lots (Figure 6).

Figure 6 – Townhouses in Port Credit Village along streetscape free of driveways and garages. Note the curbside parking.

Challenges and Obstacles

Planners and developers of transit nodes face a number of challenges and obstacles in developing successful TODs including:

- Local community concerns or NIMBYism, such as resistance to increased density, the perception of transit and increased traffic around stations, can cause delays, increase costs and block projects;
- Local economic conditions may not be favourable to investment; for example, there may be low market demand for higher density housing and other uses;
- Investment in TOD is a long term strategy that may take many years to mature;
- Poor station design and pedestrian access to stations affects the success of the station and the development around it. Transit authority policy and rules may restrict certain land uses or require car-oriented design, leading to an oversupply of parking. The transportation corridor or facility itself can be a barrier to pedestrian circulation since it can affect street patterning and non-vehicular circulation. Similarly, large parking lots usually associated with some transit nodes also affect pedestrians when they are unprotected and inhospitable places;
- Complex approvals and financing challenges for dense, mixed use development can increase developer risk;
- Zoning may not be supportive of transit-oriented uses or densities;
- Developers may fail to recognize that transit stations provide development opportunities;
- The surrounding community's existing condition, such as street patterns, pedestrian links, density and land use mix, may not be conducive to transit ridership;
- Coordinating TOD activities among multiple actors and stakeholder groups with divergent interests can be difficult;
- Transit riders may not be the same people who live in TODs. Easy access to amenities and high quality design in TODs may attract a high-income demographic that has high car usage;
- Poor, infrequent transit service may reduce the attractiveness of the TOD for potential residents and users of its services and amenities;
- The placement of rail lines along low-cost corridors can have minimal development potential; and
- Developments near traffic corridors, bus and rail lines may require special design features to control vibrations and noise.

Most of the challenges and obstacles mentioned above were either overcome or not encountered in the ten case studies described later in this article. However, there are some exceptions. For example, poor transit station design was a lingering problem in some of the case studies.

Noise and Vibration Control

Municipalities may have their own environmental noise and vibration control guidelines for developments near surface transportation corridors. In addition, the provincial or territorial ministry of transport (MOT) will have guidelines for a project near a major thoroughfare, and the ministry of environment (MOE) may require a noise assessment for a development adjacent to a railway, transit corridor, or near a heavily-traveled road. The Ontario Ministry of Environment *Noise Assessment Criteria in Land Use Planning: Publication LU-131* defines the criteria for noise impact assessment of residential and other noise sensitive land uses. In some cases, an initial noise control assessment is required in the planning stage, to determine whether the project is feasible. Developers are required to conduct a noise impact assessment of the indoor and outdoor acoustical environments, and to ensure that the required noise control measures are incorporated into the development. Control measures include acoustical barriers, building design, wall and roof construction, mitigation at the noise source, site planning and window and door design. These measures would become part of the development agreement with the municipality.

Special noise control measures may also apply to developments near railways and light rail transit corridors. Canadian National Railway's (CN) *Principal Main Line Requirements* apply to properties adjacent to a CN railway right-of-way, and include a minimum 30 metre setback, a safety berm and a noise attenuation barrier. The developer is also required to engage a consultant to carry out a noise analysis and to evaluate ground-borne vibration transmission to determine whether buildings within 75 metres of the railway would be affected by excessive vibrations. CN recommends that development agreements, offers to purchase and agreements of purchase and sale or lease of dwellings within 300 metres of the railway right-of-way contain a clause alerting the parties to the possibility that the railway might expand its operations and affect the living environment of residents in its vicinity.

TOD and an Aging Population

There will be profound changes in the age structure of the Canadian population over the next 25 years. Population aging is taking place in a society that is being reshaped by a range of remarkable demographic and socio-economic trends. This phenomenon will affect housing and communities—neighbourhoods, villages, towns and cities. Therefore communities must give more thought to the implications of an aging population. Transit-Oriented Development reinforces tenets of smart growth and livable, sustainable communities which are age-conscious and provide pedestrian-friendly streetscapes; mixing of land uses; availability of transit options and reduced reliance on automobiles.

However, some Canadian communities have made minimal progress in achieving smart growth and livability goals, such as TOD, and are thus ill prepared to accommodate the mobility needs of an aging population. Changes in attitude and planning practice are required. For example, TOD can be more age-friendly and conscious of aging community residents by paying attention to small details, such as the availability of sidewalks in good repair and resting places along pedestrian routes. These features, in combination, have a significant effect on the ability of older residents to take advantage of pedestrian routes.

Planning for walkable communities is an important component in allowing seniors to live independently. Design plans that feature walkability create safe environments for seniors, facilitate community engagement, reduce feelings of isolation and promote active lifestyles—all of which are essential for successful aging in place. The proportion of age-friendly and appropriately designed housing within walking distance of public transportation is one indicator of community walkability for seniors.

Collaboration between government and the private sector in real estate development projects, and collaboration on TOD including services such as transportation and home renovation, can be an effective strategy for implementing plans to improve seniors' quality of life. Leadership is needed to make the TOD-smart growth-livability-aging in place connection, and to push these issues to the forefront of the public policy agenda.

Implementation Tools

Planners use a variety of tools to implement TODs in desired locations. Cervero et al.(2004) state that "TOD implementation ideally starts with a vision, cultivated from broad-based public input, and proceeds to strategic station-area planning backed by appropriate zoning as well as policy incentives and regulations." Tools include:

- Master planning for a station area;
- Redevelopment planning for areas that have already been developed;
- Design guidelines;
- Planning checklists;

- Imaging, visioning and design charrettes for public consultation, as well as design working groups for achieving neighbourhood support. Neighbourhood input should be sought early in the process;
- Transfer of development rights that permits the transfer of density from one area to another, and allows residential density to be increased near transit stations;
- Public-private partnerships;
- Land value capture taxation where the increased value of private land resulting from the public transit investment is captured through a special tax;
- Tax increment financing;
- Investment in station area infrastructure/public realm;
- Local gas taxes and parking charges that are collected and dedicated to local transit investments;
- Density bonuses, and reduction or elimination of development charges;
- Relaxation of parking standards, maximum parking standards; and
- Expedited permit approvals.

Several studies indicate that TODs attract price premiums (Dunphy et al, 2003). This includes one that found that locations within walking distance of a light rail station attracted a 23% premium for commercial properties (Cervero and Duncan, 2001).

LEED ND Points for TOD

The United States Green Building Council (USGBC) has developed a draft of the *LEED for Neighbourhood Development* (LEED ND) rating system to guide and assess sustainable community development, which is being adapted for use in Canada. As of this writing, the LEED ND rating system is under review. The current draft places heavy emphasis on the proximity and provision of public transit and alternatives to the car. Two of the mandatory prerequisites are to provide nearby public transit service and create compact communities which can support public transit. Nine credits, worth a total of 34 points, are awarded for the provision of public transit and cycling facilities, and for other factors related to reducing automobile dependency and commute times. As certified projects require just 40-49 points, silver 50-59 points, gold 60-79 points and platinum 80-106 points, the public transit-related 34 points can be significant in achieving a good LEED rating. The LEED New Construction standard which is related to buildings and renovations also acknowledges the importance of public transit by awarding points for access to public transit, reduction of parking spaces and provision of alternatives to car use.

TOD Guidelines

In Ontario, the Ministry of Municipal Affairs and Housing created the *Transit Supportive Land Use Planning Guide* (1992). It provides ideas and advice to be used at the discretion of municipalities, but is not a formal statement of provincial policy. In Ontario, York Region (2006) has created a TOD guideline that brings together existing regional policies that encourage transit- and pedestrian-oriented developments, like those found in the Official Plan. The City of Ottawa (2007) has TOD guidelines that are to be applied throughout the City for all development within a 600 metre walking distance of a rapid transit stop or station. Across Canada, other municipalities, like Calgary, have TOD guidelines, as described above.

CMHC case studies

CMHC funded a study to document ten recent examples of residential developments around transit nodes in Canada, including interviews of key players and occupant surveys. The purpose of the study was to provide insight for future TODs into success factors and challenges faced by both private developers and public agencies involved in the TODs. The research team conducted the literature review, scoped potential projects, conducted the interviews, assembled the graphics and wrote the case studies.

From 25 potential developments, the team selected ten which are within a 10-minute walk of a transit station or major stop, have mixed-uses, are pedestrian-oriented and have transit-supportive densities. It was important that the selected developments cover a range of transit types and locations from both urban and suburban sites and from across Canada. They also cover a range of building heights and densities, depending on the urban context.

Each case study features interviews with the following key players:

- The transit authorities, for their views on regional growth and transit development as well as the relationship between land use and transit planning.
- The developers, to determine their motivation for pursuing the project, as well as costs, profitability, success factors such as municipal support, challenges such as neighbourhood opposition, and how they were overcome.

- The municipal planners, to determine the City's planning objectives for the node, municipal involvement in providing walk/cycle connections, zoning and other regulatory issues, financial issues such as tax incentives, cost sharing and fee exemptions, and neighbourhood input.

The research team worked with a market research firm, The Mustel Group, to survey occupants of the TOD's documented in the ten case studies, to shed light on their motivations for choosing to live there, level of satisfaction, travel patterns and demographic information. The consultants conducted the pre-tested survey by telephone, using phone directories to create the survey sample.[1] Here is a brief description of the ten case studies:

Time has two condo towers with 258 units and seven townhouses with retail and a community centre at grade. It is across the road from the SeaBus ferry terminal in North Vancouver's town centre, taking riders to downtown Vancouver. It was developed by Esplanade Capital Ventures Limited and Seagate Ventures Ltd. and completed in 2005 (Figure 7).

Collingwood Village is a master planned community in Vancouver with 16 buildings (four-storey townhouses and six- to 26-storey apartments) providing 1,917 condo units and 783 rentals with retail and community facilities at grade. A SkyTrain station is located in a corner of the village. It was developed by Concert Properties and completed in 2006 (Figure 8).

Figure 7 – Time, North Vancouver: At-grade retail and lower building form near the street with high-rise condos set back. Streetscape treatment and central courtyard provide pedestrian-oriented public amenity space. Note the SeaBus terminal and downtown Vancouver in the background.

Figure 8 – Low-rise buildings are placed closer to the existing neighbourhood than high-rise buildings are in Collingwood Village, Vancouver.

[1] Only six case studies achieved the targeted response rate (at least 30 households per case study or 20% of the households in each case study) despite exhaustive attempts to reach non-responding households. These include 33 households that responded in Time (Vancouver), 32 in Port Credit Village (Mississauga), 30 in Village de la Gare (Montréal), 45 in Metropole (Ottawa), 31 in Collingwood Village (Vancouver) and 20 in Les Cochères de la Gare (Montréal).

Short Street is a five-storey, 78-condo unit development with retail at grade, a few steps from a planned express bus stop in the suburban community of Saanich, near Victoria. Completed in 2006, the developer, Short Street Ventures/Darrell Johnson Construction, provided occupants with free bus passes for two years and a car sharing program (Figure 9).

The Bridges is a master-planned urban village, located in one of Calgary's oldest neighbourhoods. The total project will include 1,575 mid-rise, multi-family units with significant commercial and retail uses. A light rail transit station is located just south of The Bridges. It is being developed by the City of Calgary Corporate Properties & Buildings from 2000-2011 and includes many builders who purchased sites through a tendering process. The case study focuses on the Acqua and Vento buildings, built by Windmill Development Group Ltd. from 2005-2007. The project includes 44 townhouses located in two buildings above street-oriented retail units. (Figure 10).

Figure 9 – Building height and form in the Short Street project, in Saanich, a suburban area of Victoria, is compatible with the surrounding area.

Figure 10 – Street-oriented retail with condos above in the Vento project in The Bridges, Calgary.

Photo Source: City of Mississauga

Figure 11 – Mixed land use and housing forms around public amenity spaces, including waterfront park and path in Port Credit Village, Mississauga. Note the location of the commuter rail station in the background.

Photo source: © 2008 Microsoft Corporation. All rights reserved.

Figure 12 – The Equinox towers with pedestrian bridge (right) to transit station (centre) in Scarborough area of City of Toronto

Port Credit Village has 225 mid-rise condo apartments up to six-storeys, 168 townhouses and 18 live/work townhouses with at-grade retail and office uses. It is in the Port Credit urban village in Mississauga and is 400-800 metres from the Go Transit station (commuter rail) with service to downtown Toronto. It was developed by FRAM Building Group and Slokker Canada (FRAM/Slokker) and completed in 2005 (Figure 11).

Equinox has two 37-storey towers with 689 condos and some retail at grade. It is a few steps from a light rapid transit station in Scarborough, a suburban area of the City of Toronto. Developed by Goldman Group and built by Monarch Construction, it was completed in 2005 (Figure 12).

Metropole has a 153-condo, 32-storey tower with 68 townhouses, adjacent to a Transitway station (rapid bus) in an urban village in Ottawa. It was developed by Minto Developments Inc. in 2004 (Figure 13).

Les Cochères de la Gare is a 94-condo four-storey building a few steps from a commuter rail station in Sainte-Thérèse, an old town in the Montréal area. It was developed by Habitations Viagères and completed in 2005 (Figure 14).

Figure 13 – Mix of townhouses and high-rise building adjacent to Transitway station in Metropole, Ottawa.

Figure 14 – Les Cochères de la Gare (near Montréal) with public path along railway corridor.

Figure 15 – Pedestrian-oriented streetscape free of garages and driveways in Village de la Gare, near Montréal.

Figure 16 – Portland Hills, Halifax, is an example of a transit node surrounded primarily by single-family homes in a suburban context.

Village de la Gare is partially built, with 1000 single-detached, duplex, townhouse and three-storey, multi-unit dwellings, commercial uses and a school planned. It is 200-750 metres from the commuter rail station in Mont-Saint-Hilaire, a small town about 40 km from downtown Montréal. It is being developed by Groupe Cooke Bombardier Lesage Inc. (Groupe CBL) from 2002-2012 (Figure 15).

Portland Hills is in a suburban area of Dartmouth in the Halifax region. It has 423 single-detached homes, 269 townhouses and 440 units in four-storey apartments with retail, a school and a rapid bus station. It was developed by Clayton Developments from 2004-2008 (Figure 16).

1. What TOD design features were integrated into the projects:

As discussed above, TODs should include the following features:

- convenient and pleasant pedestrian connections;
- high-quality public spaces (Figure 17);
- transit-supportive densities with the most dense forms near the transit station;
- a mix of land-uses including attractions for transit rides, like convenient retail; and
- unobtrusive parking. Requirements should reflect the potential for reduced auto use.

All projects are well within 800 m (at their furthest point) of the transit station, which puts them all within the 10-minute walk shed people are generally willing to walk, and half the projects are less than 100 m from the station. The routes are generally on paths separated from roads or on pedestrian-oriented streets, except in two developments where the pedestrian environment is pleasant within the project site but not on busier roads between it and the transit station. In spite of this, many of the transit stations are uninviting, utilitarian designs. Improvements could be made to the way that the transit stations interface with the rest of the neighbourhood. All but one project exceed the minimum residential density of 22 units per hectare (uph) that is considered necessary to support viable light rail, and most of the projects have over 100 uph. The lowest densities are in suburban or exurban areas, distant from urban centres. Half the projects feature a variety of housing types, including low- and high-rise and single- and multi-family dwellings, with the highest densities located closest to the transit stations. All but two of the projects are mixed-use; however, those two developments are located within mixed-used areas (refer to Table 1).

Figure 17 – High-quality landscape treatment along pedestrian links from Time to SeaBus terminal in North Vancouver.

2. Was access to transit and other amenities a motivational factor for developers and occupants?

All developers[2] felt that transit proximity helped market the project to occupants or was a motivation in choosing to build in that location. Some said it was a major motivation and resulted in a price premium (e.g. Collingwood Village, Time, Equinox).

[2] In Portland Hills, the transit station was built after the first phase was already being developed. But the developer indicated that buyers in subsequent phases were motivated by the proximity to the transit station.

Table 1: TOD features in the case studies

Project name	Pedestrian connection to station (distance, form and quality)	Housing mix	Other land uses	Gross res. density (uph)[3]	Parking
Time - North Vancouver, BC	- 325 m - excellent from Time to SeaBus terminal, but bus station is underground and uninviting - one link is all off-road, with a footbridge over a road, amenities and landscaped spaces along the route - activities, retail make the terminal a "place"	- mostly high-rise condos with some townhouses	- grocery store, drug store, community centre - non-res. m^2 are 75% of the total site area.	322	- 1.3 stalls per res. unit, underground - 261 non-res. stalls, underground with some surface
Collingwood Village - Vancouver, BC	- 25-700 m - pedestrian-oriented streets (trees, traffic calming, small blocks with mid-block connectors) and paths through well-designed open spaces - station uninviting	4-storey townhouses/ garden apts. and 6- to 26-storey condo and rental apartments	- grocery store, drug store, school, community centre, daycare, other retail, neighbourhood policing centre - m^2 are 6% of the total site area	239	- 1.35 stalls per res. unit in phase 1 and 1.04 in phase 2, all underground
Short Street - Saanich, BC	- 100 m (to major stop) - pedestrian-friendly within the site but auto-oriented arterials beyond the site	- mid-rise condos	- retail - m^2 are 1.4% of the total site area	157	- 1.1 stalls per res. unit, underground - 38 commercial stalls, surface, used by res. after hours
The Bridges - (Acqua and Vento), Calgary, AB	- The Bridges: 100 to 600 m - Acqua and Vento - up to 575 m - excellent - paths through parks and pedestrian-oriented streets with amenities, traffic calming - pedestrian bridge over arterial road	- The Bridges: mix of multi-family units (3-12 storeys) townhouses and live/work units - Acqua and Vento: townhouses	- The Bridges will be 10% street level commercial/ retail and 32% open space - make the station a retail node - Acqua and Vento commercial m^2 are 65% of their site area	The Bridges: avg. 320 close to station, avg. 210 close to existing neighour-hood	- 1.25 stalls per res. unit, underground - 1 stall per 7 m^2 net floor area for food services - on-street parking was accepted for ground-floor non-res., which reduced parking need by 25% - Acqua has 19 commercial stalls, Vento has 9
Port Credit Village - Mississauga, ON	- 400-800 m - excellent within the site (landscaped paths and well-designed open spaces) - beyond site, along sidewalks and busier roads	- low- and mid-rise multi-family condos, townhouses, live/work units	- office and retail - non-res. m^2 are 5% of the total site area	39	- 1.5-1.7 stalls per multi-family unit - 3+/townhouse - 70 commercial stalls, surface and underground

[3] Gross residential density is calculated as the number of residential units divided by the site area.

Table 1: TOD features in the case studies (continued)

Project name	Pedestrian connection to station (distance, form and quality)	Housing mix	Other land uses	Gross res. density (uph)[3]	Parking
Equinox - Toronto, ON	- 25 m - excellent –path and pedestrian bridge	- high-rise condos	- retail m² are 6% of the total site area	543	- 1.1 stalls per res. unit, all underground except 6 surface
Metropole – Ottawa, ON	- 200 m - good - sidewalks on residential streets and off-road path	- high-rise condos and townhouses	- none but located in a mixed-use neighbourhood	79	- 1 stall per res. unit in high-rise, underground (plus some surface) - 1 to 2/unit for townhouses (driveways and garages)
Les Cochères de la Gare – Sainte-Thérèse, QC	- 90 m - excellent - off-road path	- mid-rise condos	- none but walking distance to mixed-use small town	134	- 1 stall per res. unit, surface, hidden in interior courtyard
Village de la Gare – Mont-Saint-Hilaire, QC .	- 200-750 m - good - paths and pedestrian-friendly streets with sidewalks	- detached homes, duplexes, townhouses, low-rise apartments	- will include commercial uses, community facility and a school	30 uph multi-family and 20 uph single-family	- 1.5 stalls per res. unit, surface - 444 at Park & Ride, surface
Portland Hills - Darthmouth, NS	- 50-500 m - extensive recreational trails to station and on sidewalks on res. streets and arterial	- detached homes, townhouses, low-rise apartments	- retail m² are 7% of the total site area	10.6	- 1.4 stalls per multi-family unit, ½ below-, ½ above-grade - 2 (garage and driveway) per single-family unit - 35 commercial stalls and 231 Park & Ride, surface

Proximity to transit was the number one motivating factor among surveyed occupants for three out of six[4] projects (Time, Collingwood, Village de la Gare). When asked if it had a strong or some influence, the response varied from a low of 45% in one of the case studies to a high of 85% in another.

The projects generally had excellent access to urban and/or natural amenities such as vibrant, mixed-use neighbourhoods, waterfronts, trails. Proximity to amenities was the primary motivator for surveyed occupants of two out of six projects (Port Credit Village and Metropole), and the second most important factor for another two (Time, Village de la Gare). Most of the developers saw the excellent local amenities as a major motivation for their investment decision.

[4] Only six of the ten case studies captured a sufficient sample size on the occupant survey. See footnote 1 for the survey response rates. More findings from the survey are presented later in this article.

3. Were the projects a financial success for the developers?

All but one developer said the project met their profit expectations, but the one who said it did not meet expectations (Short Street) attributed it mainly to construction price increases and delays during land assembly. Profit expectations were exceeded in two projects.

4. Were the projects initiated by municipalities? Were the projects compatible with local/regional land-use plans?

All but one of the projects fit the municipality's goals for compact, mixed-use, pedestrian-oriented development around transit nodes. The one exception is the Portland Hills project where the region essentially retrofitted rapid transit services into an already planned lower density suburban area.

In four cases (Time, The Bridges, Collingwood Village and Les Cochères de la Gare) the municipality initiated the projects, assembling and/or rezoning public land parcels they targeted for TOD near transit stations and selling those properties to developers with specific design criteria. In another case (Village de la Gare), the developer, transit authority and municipality were partners in the development of the transit station and neighbourhood. The other projects were initiated by private developers, but supportive of overall City goals for TOD near existing transit stations, which facilitated approvals and cooperation between parties. In one case (Portland Hills) the transit station was added after the residential development had already begun.

Time and Collingwood Villlage: Transit authority investments must support the growth plan of the Greater Vancouver Regional District (GVRD) which focuses growth around regional centres that are compact, complete and offer transportation choice in areas that are well served by transit. In Time, the City of North Vancouver assembled and rezoned land parcels in the declining industrial area around the SeaBus terminal for transit-oriented re-development by private developers. In Collingwood Village, the City of Vancouver created a master plan, rezoned the land and negotiated with the developer to include specific TOD features (see Table 1).

Short Street: The Capital Regional District (greater Victoria) regional growth strategy focuses growth in eight transit-oriented nodes that are walkable, compact and mixed-use developments. This project is in one of them and the District of Saanich sees it as a good fit with their objectives for the node.

The Bridges (Acqua and Vento): The Bridges is being developed as a master-planned TOD by the City of Calgary, selling serviced lots to private developers (see Table 1 for details). Numerous policies and guidelines have been adopted to integrate land use and transportation throughout Calgary, including the City's TOD guidelines (2004) for areas within 600 m of a transit station. There has recently been a modest amount of intensification in a few light rail transit (LRT) stations in Calgary. But due to the intensification efforts at this node, ridership at this station had increased by 30% from its former use as a hospital, well before build-out.

Port Credit Village: The City of Mississauga policy encourages transit-supportive densities and land uses near 'GO' commuter train stations. In Port Credit, which has a mixed-use, historic town centre, the commuter train station has been in place for many years and the adjacent area has gradually been intensifying as developers initiate projects (Figure 18).

Equinox: This development fits well with Scarborough's Official Plan direction for intensification around the City Centre and LRT station. The area has seen significant increases in population and ridership, which have led the transit authority and municipality to review options for adding capacity to the busy line.

Metropole: The project was initiated by a private developer and is consistent with City of Ottawa plans and policies, which encourage higher density near a transit node. The transit station had been in place for several years and the adjacent area has gradually been intensifying.

Village de la Gare: This master-planned TOD was developed hand-in-hand with the commuter train station. The transit authority and Town of Mont-Saint-Hilaire, near Montréal, bought the land for the station from the developer, worked with the developer on the site planning of Village de la Gare, and shared infrastructure costs.

Figure 18 – Commercial uses adjacent to historic main street of Port Credit, Mississauga.

Les Cochères de la Gare: The Town of Sainte-Thérèse, near Montréal, produced a development concept plan to redevelop the disused industrial area around the commuter rail line in concert with the transit station. The municipality adopted zoning changes to support transit-oriented development, and purchased and serviced the lots before re-selling them to developers.

Portland Hills: Portland Hills was not originally planned as a TOD. While the Phase 1 neighbourhood was being developed privately, the Halifax Regional Municipality's transit authority purchased the site from the developer for the rapid bus station. It located the new route and station on the basis of existing transit demand, land availability and plans for new residential development along the corridor.

5. Was municipal support an important factor in the project success?

All the projects involved the developer and the municipality working cooperatively. Generally, the developers felt that municipal support was a key success factor. In some cases, municipal requirements for amenities increased costs and affected profits. In most cases, the municipality provided flexibility on parking and zoning, as well as marketing of the area and cost sharing on infrastructure and amenities. In return, they required the developers to provide certain amenities, such as pedestrian links to the transit station.

Time: The City of North Vancouver assembled several land parcels it owned in a former industrial area in decline and targeted higher density, mixed-use redevelopment for the area. It rezoned and contracted with private companies to develop these parcels. It required the developer to build a community centre, retail, pedestrian links to the terminal and public parking, but allowed rezoning and a density increase. It also conducted public consultation and marketed the project across the Vancouver region.

Collingwood Village: The City of Vancouver created a station area plan with extensive public input over eight years which led to rezoning the site from industrial use and establishing specific design features. It conducted further public consultation as it negotiated an amenity package and design features with the developer, including a community centre and policing centre. The municipality reduced the parking requirement from 1.75 spaces per unit to 1.34 and, in later phases to 1.04 spaces per unit. It also partnered with the developer to build the rental housing and contributed $5 million to the cost of amenities.

Short Street: The District of Saanich partnered with the developer and the transit authority to create a two-year free bus pass system for occupants. This and other TOD efforts by the developer, such as a car share program, led the municipality to reduce parking by 21% to 1.1 spaces per unit. The municipality approved rezoning and supported changes to engineering standards, such as narrower streets and wider, pedestrian-friendly sidewalks, although obtaining engineering approvals on these non-standard features was difficult and time consuming.

The Bridges (Acqua and Vento): The City of Calgary obtained the planning approvals, established design guidelines and built the infrastructure, and is selling fully serviced sites to private sector builders, including the builder of Acqua and Vento.

The municipality built the following infrastructure: a large park; a pedestrian-friendly network of streets and paths; a pedestrian bridge (Figure 19) and plaza at the LRT station; new smaller scale access points into the neighbourhood; and new utilities. There were challenges in obtaining approval from some municipal departments for non-standard roads, streetscapes, open space, landscaping, and parking. As a result, a customized infrastructure committee was struck to make decisions regarding the non-standard features to ensure that technical experts were involved in creating and accepting the new standards.

Port Credit Village: The City of Mississauga and the developer shared the costs of a public trail and extensive park along the waterfront. The City saw the project as an opportunity to redevelop a vacant industrial site, open the waterfront to public use, and provide a TOD showcase with transit-supportive densities, mixed-uses, pedestrian links and public spaces (Figure 20).

Equinox: In exchange for an increase in density, the developer was required to build and pay for a public pedestrian bridge (Figure 12) and walkway to the transit station, at a cost of $270,000 and contribute $70,000 for a playground in a public park. The City of Toronto allowed an amendment to the Official Plan and zoning to permit the residential use and higher density the developer was proposing.

Metropole: The City of Ottawa was flexible on zoning and parking, requiring only 1 space per unit in buildings that are within 400 m of a transit station. It worked with the developer and adjoining property owners to establish a pedestrian path through the site to the station.

Figure 19 – The pedestrian bridge over a busy arterial road adjacent to The Bridges, Calgary, is part of a pedestrian-friendly network of routes and open spaces.

Figure 20 – Public square surrounded by retail and other land uses at Port Credit Village, Mississauga.

Les Cochères de la Gare: According to the developer, the Town of Sainte-Thérèse played a key role in assuring the success of the development. The municipality created a development plan for the area, rezoned, purchased and serviced the lots before selling them to developers. In addition, it developed a linear park and paths along the rail line (Figure 14) and conducted public consultation on the area plan which helped the individual developers achieve community acceptance for their individual projects.

Village de la Gare: The developer, the Town of Mont-Saint-Hilaire and the transit authority shared costs of infrastructure, site preparation and station development and worked together on design guidelines. Cost sharing negotiations were complicated and lengthy. The municipality assisted with marketing, and lowered parking requirements from 2.0 to 1.5 spaces per unit. They also required no parking for the commercial area around the station.

Portland Hills: While not originally designed as a TOD, the Halifax Regional Municipality negotiated with the developer to include transit-supportive strategies, such as pedestrian connections to the station and denser development closer to the station.

6. Was neighbourhood opposition a barrier and if so, how was it overcome?

In all of the projects, the City conducted public consultation, working with the developers and the neighbourhood residents collaboratively to address concerns. In about half the cases, such as Time, Collingwood Village, The Bridges and Les Cochères de la Gare, extensive consultation on an area plan smoothed the way to community acceptance of individual projects.

Several of the municipal planners experienced a push/pull between neighbourhood concerns and intensification goals. For example, neighbours in lower density areas may oppose medium- to high-density housing even though it is desirable from a TOD-perspective. As a result, the developers worked toward achieving that density in a way that the neighbourhood supported, such as transitioning to lower densities adjacent to existing neighbourhoods. In only two cases, some lingering concerns were noted about overall changes to the neighbourhood.

Time: The City consulted the public on the plan for redevelopment of the Lonsdale area. Some residents opposed the Time proposal because of its density, views and height but supported it after the developer reduced the building heights. Now it is seen as a positive contribution to the neighbourhood.

Collingwood Village: Extensive communication with neighbourhood groups throughout the process resulted in strong neighbourhood support. A well conceived plan to phase the development over 16 years helped to ease the transition from light industrial to residential use. The developer worked with the community to address their concerns and find creative ways to incorporate their long-term objectives. Density increases were negotiated in exchange for significant community amenities and design features. For example, although the development is denser than the surrounding neighbourhood, it has achieved a high level of compatibility with its surroundings through appropriate scale transitions and urban design initiatives. These include mid-rise podiums around high-rise towers, and stepping the towers back from the street.

Short Street: The project builds on a plan by the municipality to intensify the area. There was no opposition, as there were few existing residents nearby.

The Bridges (Acqua and Vento): Extensive public consultation by the municipality helped resolve the initial outcry over the hospital relocation, which was a decision made by the Province. Consultation on the area concept plan and requirements for builders to comply with the design guidelines created a high degree of certainty for local residents regarding what would be built (Figure 21). As a result, none of the phase one or two development permits was appealed. The highest density was situated around the transit station, with lower buildings located along the edges of the development for better integration with existing neighbourhoods.

Port Credit Village: The previous owner's proposal met significant opposition over heights and density, which were required to be reduced. After reviewing the proposal, the municipality initiated a district plan review that attracted considerable public input. A long and involved public input process followed to create a workable plan, involving meetings, workshops and open houses. The municipality and community worked with the current developer to produce a master plan, which influenced a new proposal that was ultimately approved. The proposal generally was supported by the community, although there are some lingering concerns over densification of the broader area.

Equinox: The municipality met with an advisory committee and held an open house with the developer to gather public input. The municipality sought revisions to the proposal based on concerns which included the lack of parkland and direct pedestrian access to the transit station.

Figure 21 – Individual entrances from the sidewalk and building set back give this 6-storey building in The Bridges a human scale.

Since completion, most people recognize that the project animates the area and provides "eyes on the park".

Metropole: The neighbours opposed the original proposal for two mid-rise towers, so the developer changed the plan to one high-rise and townhouses, then did sun and traffic impact studies to alleviate concerns and gain project approval. Because of lingering community concerns over densification of the broader area in general, a community plan for the area was later initiated.

Village de la Gare: Neighbourhood concerns over the project scale and traffic were addressed by including a wide boulevard from the station to existing roads. Concerns about site contamination and mixed-use were alleviated by providing information to the community.

Les Cochères de la Gare: The Town of Sainte-Thérèse helped build support for the project through public consultations held on the plan for the area. Initially concerns about heights and densities were voiced by residents but detailed planning and development schemes helped relieve these concerns.

Portland Hills: The municipality coordinated community input. The main concern of the neighbours was that areas adjacent to existing single-family homes should have homes of similar density and type. Through a lengthy development agreement process, the developer changed the plan accordingly and the municipality approved it, even though a higher density would have been more appropriate for a TOD.

7. How do selling prices and rents for dwellings compare with local averages?

When compared with local average selling prices or rents for the same type of unit for new construction, the cost of a dwelling in four of the developments was higher than average. However, the cost of a dwelling was the same as the local average in four developments (Collingwod Village, Short Street, Time and Village de la Gare), and lower in two (Equinox and Les Cochères de la Gare).

8. Who are the occupants?

The key findings in a survey of occupants for six of the case studies are as follows[5].

- The respondents' household incomes were higher than the Census Metropolitan Areas (CMA) average in four projects. In two projects, (Les Cochères de la Gare and Collingwood) a higher percentage of respondents were in the middle income range.
- Five developments had smaller household sizes than the CMA average, and one (Village de la Gare) had the same household sizes.
- Respondents in four developments were younger than the CMA average, and older in two developments (Metropole and Port Credit Village). In both of these developments, proximity to transit was not one of the main motivational factors for choosing that location.

[5] Only six of the ten case studies captured a sufficient sample size on the occupant survey. See footnote 1 for details on the survey response rates.

9. What are the occupants' travel patterns?

- Household car ownership rates were higher than the CMA average in four developments, lower in one (Collingwood Village) and the same in another (Time), although fewer households in that project owned two cars.
- Significantly more respondents took transit to work than the CMA average in four developments, of which ridership was double the average in two developments (Village de la Gare and Time) and triple the average in one development (Collingwood Village). Transit to work rates were slightly lower than the CMA average in Les Cochères de la Gare, but higher than the local town average. They were half the average among respondents in Port Credit Village, where our survey indicates that respondents were wealthier and older than average and there were fewer people and more cars per household, Most respondents in that development cited proximity to amenities, like shopping, parks and trails as their main motivation for choosing that location.
- All respondents who took transit to work, walked to the station in five developments, and most did so in one development (Village de la Gare).
- A small percentage of respondents changed their travel habits since moving there, usually taking transit to work more and walking for shopping more than they did before. Although transit to work rates were significantly higher than average, most respondents may have chosen that location to make their existing travel patterns more convenient. The most change was noted in Time, where 21% took transit to work more than before and 60% walked for shopping more.

Are occupants satisfied and what trade-offs did they make?

- Satisfaction rates were high in all developments. Among the features identified, satisfaction rates were highest for design, appearance and size of their home, neighbourhood amenities and neighbourhood design and appearance. Even features with the lowest satisfaction rates to parking and unit cost, had satisfaction rates over 75%.
- All respondents in all developments said the path to the transit station was somewhat or very convenient and pleasant. When asked about specific features that make the path pleasant, safe sidewalks along the street, trees and other landscaping along the route and walking paths that are separate from the street were given the highest satisfaction rates. The lowest satisfaction rates were for parks and public amenities along the route.
- Most respondents in every development said their previous dwelling was of a lower density than their current one. Most also said they paid more for this dwelling than for their previous one. Roughly one-third of these respondents said they accepted a higher price because of access to transit, one-third because of access to neighbourhood amenities and half because of design/architectural features of the unit itself [6].

Conclusions

When it comes to TOD, one size does not fit all. These case studies show that TODs can include a wide range of housing types from high-rise towers to single-family homes, depending on the urban context and the marketplace. All but one proved to be financially successful for the developer and demonstrate that a successful TOD model can have a broad spectrum of dwelling types and densities, including starter and high-end, single-family and high-rise dwellings. These case studies show that TODs can be small or large in scale, ranging from 0.45 ha (1.1 acres) in Short Street to 73 ha (180 acres) in Village de la Gare.

The municipality played a strong area-planning role in many of the developments, by identifying the opportunity to create a TOD around a transit station, encoding this in a plan, zoning land for this purpose and attracting developer interest. This sent a clear signal to developers that this is the kind of development the municipality wants. Even the projects that were developer-initiated involved cooperation between the municipality and the developer, for example, through flexibility on parking and zoning and cost sharing on amenities and infrastructure.

While the projects owe part of their success to close collaboration between the developer and municipality, only a few involved the local transit authority in a meaningful way. Village de la Gare is one example where the train station is a focus of development. The Bridges is another – pedestrian connections and safety improvements were made to the adjacent LRT station as part of the overall project. Often, the design of the transit station is not well co-ordinated with the

[6] Respondents could have picked more than one answer.

TOD. This is because the transit authority is usually responsible for station area design and development which tends to happen in advance of the neighbourhood developing. However, the Vancouver area is seeing greater levels of cooperation between the transit authority, the local municipalities and developers in co-ordinating all aspects of urban design, which is leading to more integrated designs. More integration with transit station design would assist in making pedestrian connections even more accessible, convenient and attractive. It also may allow for truly innovative transit initiatives, such as the free transit passes offered to all residents in the Short Street development.

Effective public involvement is essential to the success of the development. While neighbourhoods are often initially reluctant to support proposed changes in density and mixed-use, public participation throughout project development satisfied most concerns of the public. Municipal planning staff played a key role in gathering public input and finding solutions that are acceptable to both developers and the community.

The occupants surveyed tended to have higher incomes and fewer people per household than the area average, with some exceptions. For most of the developments, respondents owned more cars than the area average, yet used public transit to get to work more.

A small percentage of respondents changed their travel habits since moving to the TOD, usually taking transit to work and walking to shopping more than they did before. Most live in a denser form of housing than their previous location, even though they paid more for it, citing location most frequently as their motivation. This and the financial success of these TOD projects demonstrates that it is possible to attract a market previously foreign to higher density living due to the benefits of the development. High-quality design, neighbourhood character and proximity to amenities and transit are key factors in attracting residents (Figure 22).

In many cases it was difficult to implement non-standard street design features, such as planting trees along narrower streets. This required collaboration between different municipal departments, resulting in extra time and effort, as did reductions in parking requirements. All TODs surveyed featured improvements to the pedestrian environment and pedestrian connections to the transit station.

To see the individual case studies, go to http://www.cmhc.ca/en/inpr/su/sucopl/sucopl_007.cfm. These are part of a CMHC series of over 60 case studies on residential intensification, brownfield redevelopment and greyfield redevelopment.

Figure 22 – High-quality urban design, public open spaces and pedestrian networks through-out The Bridges, Calgary, add to the attractiveness of higher density housing. Occupants of the TOD case studies generally were willing to trade off low density housing for quality design and great location.

Transit-oriented development: Canadian case studies

Questions:

1. TODs are within what distance of a transit node and what types of transit modes serve those nodes?
2. Describe 3 design features that should be included in a TOD?
3. List 2 strategies for making parking efficient, unobtrusive and not over-supplied.
4. Describe 2 challenges of TODs that emerged in the 10 case studies, even if they were overcome.
5. What design features can help satisfy neighbourhood concerns about density?
6. What municipal policies and initiatives can facilitate TODs?
7. How profitable were these TODs for the developers?
8. How affordable were they?
9. What are some characteristics of occupants who were attracted to these developments?

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