

LAND USE

Primer

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The Urban Mobility Task Force, under the **Council of Ministers Responsible for Transportation and Highway Safety**, developed this document as part of a series of Primers looking at current mobility issues affecting the Canadian urban landscape today. The Primers examine the current state of these issues and have identified associated trends, challenges, and opportunities. They are short overviews and are designed to initiate a discussion on urban mobility issues intended for transportation policy professionals, planners, and decision makers.

INTRODUCTION

Transportation and land use are foundational to the sustainable growth of the economy and the health and connectivity of communities. The investments made in transportation infrastructure and optimization of the existing network exert a significant influence on residential, commercial and industrial development patterns. At the same time, decisions about community planning impact transportation demand around specific locations, both in terms of volume and type (e.g., passenger vs. freight transportation). These points of intersection between transportation and land use can have significant implications for sprawl and density, congestion, goods movement, access to services, and ultimately economic growth. Land is a non-renewable resource, and it is particularly scarce in urban regions, making its allocation a balancing exercise between transportation needs of goods and people. This module will explore the link that exists between transportation and land use, and its related challenges, trends, and opportunities.

CURRENT STATE

While not permanent, changes to the built environment are long-lasting and difficult to reverse on the short- or medium-term. Over the last century, transportation and land-use practices have positioned cars as the main mode of transportation, affecting both the portion of land dedicated to their usage and the location and design of development. Land-use practices favouring car use in urban regions, which were common in the past, are self-fulfilling: they disperse activities, provide generous parking supply, intensify suburbanization, and reduce travel options, which ultimately increase car ownership and dependency.¹ While implemented with good intentions, this type of car-oriented transportation planning and land-use development does not meet the needs of travelers today and can have counterproductive effects on a wide range of public policy objectives.

Urban sprawl is a multifaceted issue, but sustained reliance on cars is one of its main drivers. Cars can offer some convenience, are becoming more fuel-efficient,² and are involved in less collisions,³ but it remains

LAND USE AND TRANSPORTATION

Land use and transportation are interdependent – together, they shape the urban form and its associated mobility. Land-use patterns manage the spatial accumulation of activities into the built environment. They largely influence business locations and where people live, work and play. These activities can take place in different locations, which generates movement of goods and people and shapes transportation demand. Governments attempt to accommodate this demand by working to increase transportation supply. However, by making certain locations more accessible, they also become more attractive to developers and businesses, which in turn, contributes to shaping land-use patterns. This creates a cyclical feedback loop between land use and transportation, which is the basic rationale for greater integration between these two forces.



important for governments to offer efficient transportation alternatives that reduce congestion and sprawl. Transportation impacts urban sprawl and the density of communities by allocating an amount of land for transportation corridors and facilities. Not all modes are equal – walking and biking requires significantly less space than driving and parking.⁴ In addition, driving at a higher speed, on the highway or a large boulevard, will require even more space to ensure safety, including physical separation from adjacent land uses and other transportation modes. And allocating this space means that trade-offs are made; less space can be allocated for other productive uses, including residential and commercial. In turn, prioritizing a mode like driving can encourage further urban sprawl as less space becomes available. In fact, in urban regions where driving dominates, roads and parking areas account for 35 to 50 per cent of their territory.⁵ The effects of urban sprawl on transportation are linked to a number of negative impacts on cost-efficiency, economic productivity, environmental sustainability and public health. Canada's urban regions may be disproportionately affected by this issue, with the lowest population density among all member nations of the Organization for Economic Co-operation and Development (OECD), approximately one third of the OECD average.⁶ Although there are opportunities to improve urban sprawl and congestion, the complexity of these issues should be noted. For instance, proximity to work/school from housing, housing affordability, physical capabilities, and preference to live in rural environments are all factors that affect individuals' transportation choices.

Cost-efficiency and affordability – When it comes to public policy, there is a strong business case for high-density, compact urban regions that decrease the need for considerable travel. Governments can provide public goods and services in a cost-efficient manner by reducing capital (e.g., transportation, water, sewage and other infrastructure) and operational (e.g.,

emergency response) costs associated with long distances and dispersed settlement patterns.⁷ Low-density areas have limited or cost-prohibitive transit and active transportation opportunities, which reduces governments' ability to provide transportation options to these areas. For families, the transportation cost burden of owning and operating cars is usually the second largest after housing. Reducing that burden through land use that improves accessibility to goods, services and lower-cost transportation modes could be one way to improve affordability and allow families to redirect their financial resources into much more socially and economically productive areas.⁸

Economic productivity – Urban sprawl also induces higher levels of congestion, which has an impact on economic productivity and fluidity of freight. Research conducted by Transport Canada has found that, in many of the country's large urban areas, congestion has reached acute levels that are imposing significant annual costs in excess of \$4.6 billion on drivers, the economy, the environment, and the quality of life of Canadians, with nearly \$3.7 billion associated with congestion in the Toronto, Montréal and Vancouver regions.⁹ In short, sprawl creates longer trip distances and adds higher levels of traffic on corridors leading to urban centres, which, in turn, impacts economic performance due to reduced flow of goods, wasted time and higher operation costs for travellers and businesses. Other land-use planning decisions have an impact on the fluidity of freight, which hinders Canada's ability for trade growth. For example, freight transportation activities often take place on industrially-zoned land, which are increasingly scarce in Canada's largest urban regions. In order to accommodate growing trade (import and export), transportation infrastructure either needs to increase and/or be used more optimally (or both in many cases). However, expansion of freight activities (e.g., more trains, more trucks) in urban regions sometimes faces oppositions (e.g., by local



residents, condo developers) due to liveability reasons.

Attitudes and preferences – As land to expand roadways and other infrastructure becomes scarcer, governments are turning to the behaviour of individuals and businesses to address transportation-related issues. Encouraging travel behaviour changes (e.g., through travel demand management strategies – see Opportunities section for more details) could help optimize the existing infrastructure and enhance sustainability goals. However, why and how people and businesses use transportation systems and decide where to live or do business is dynamic and multifaceted. There are a variety of factors influencing how people live, work, play, and travel, including their demographics, their socio-economic status, their transportation needs, their knowledge and perception (i.e., of the system, the impact of their choices, the availability of technologies, etc.), and their preferences and location. For instance, do consumers actually prefer a suburban lifestyle and car dependency? Low-density residential areas have distinctive attributes (e.g., larger homes, parks, lower noise, better air quality and exposure to sunlight) that are attractive to many households. However, would they be willing to live in higher-density areas if transit was accessible, frequent, reliable, and fast? Trade-offs exist between location costs, either residential or commercial, and those of transportation. Better understanding of people's and businesses' transportation preferences could help inform how planners design transportation options and communities that encourage travel behaviours that support a healthy, sustainable environment, meet community and business needs, and meet the policy goals of governments.

Environmental sustainability – Longer travel distances associated with urban sprawl have a significant impact on the environment through limited transportation alternatives to cars (despite significant

advancements in regional rail and bus services through regional transportation agencies), higher reliance on cars, and in turn increased greenhouse gas (GHG) emissions. According to the OECD, land use patterns have been linked to approximately one third of all human-made CO₂ emissions.¹⁰ By the same token, urban sprawl spreads further into natural areas, damaging ecosystems and interfering with the valuable environmental processes they perform (e.g., stormwater management, shading and heat moderation). This further degrades the climate resiliency of urban areas.

Public safety and health – Public safety and health is also affected by urban sprawl. Lower speeds, such as those associated with more compact urban centres, reduce severity of crash incidents and the probability of death.¹¹ In addition, traffic-related pollutants, which are emitted in greater volumes because of sprawl and congestion, have serious respiratory and other health implications for Canadians.¹² Urban design also encourages the use of certain modes over others, and active transportation modes (e.g., walking and cycling) can reduce rates of chronic disease such as heart disease and cancer.¹³

Many governments are mitigating urban sprawl issues through growth management plans and optimizing infrastructure through transportation demand management measures. In Canada's urban regions, transportation investment decisions are increasingly connected to land-use planning. Land-use policy mechanisms can contribute to reduced transportation demand and delivering cost-efficient transportation by favouring higher density regions and discouraging dispersed suburban sprawl patterns.¹⁴

Proactive coordination between transportation and land use varies across Canada's urban regions. Planning needs vary based on characteristics of urban centres, and benefits and challenges of



integration may be context-dependent. There is still room for governments to leverage land use and transportation to their full potential in order to achieve multiple policy objectives (e.g., congestion relief, reductions of GHGs, affordable housing, compact communities, and seamless multi-modal transportation connections).

CHALLENGES

Coordination

Coordinating between levels of government, policy sectors, stakeholders and the public is the first challenge when navigating the land-use and transportation interface. In Canada's large urban regions, federal, provincial and local governments play a role in integrating land-use and transportation planning: the federal government owns and exerts significant power over many urban transportation assets (e.g., port and airport authorities, inter-city rail); municipalities are needed because of the volume of localized information required to make context-specific land-use decisions, and given their responsibility in delivering local transportation; and provincial governments are needed to ensure regional collaboration and consistency.¹⁵

Aligning principles and priorities between governments and actors to improve urban mobility and curb sprawl can prove challenging. For further integration to take place, land-use and transportation planning processes must be mutually respectful. Jurisdictional territoriality and competition for new development can lead to disagreement on a common approach to growth management and incompatibility of land-use practices between neighbouring municipalities or regions. All stakeholders across large regions need to work cooperatively and in concert, within their respective sphere of competence. For instance, municipalities that are in close proximity to one another can work collaboratively on developing transit

LAND-USE PLANNING IN CANADA

In Canada, the federal government exerts direct land-use power over its assets and influences land use patterns through its involvement in environmental protection, resource development and housing, for instance, and through important financial contribution. However, provinces are constitutionally responsible for creating legal and policy frameworks for land-use planning systems. The degree of centralization and delegation of powers to local governments varies across the country. The most populous provinces, where large urban centres are, tend to have more decentralized land-use planning systems where municipalities play a greater role. Despite differences, municipalities generally have similar responsibilities, including the development of land-use plans and by-laws. All provinces and territories have one or several regional plans with high-level objectives and policy goals for their entire territory or for targeted areas. At the local level, municipalities have community plans and other smaller scale plans for specific districts, subdivisions or sites.

systems, active transportation and goods movement initiatives that are interoperable and seamless for the benefit of users. For instance, the cities of Mississauga, Brampton and Caledon have come together to establish the Peel Region's Goods Movement Strategic Plan, which has as a core strategic direction to enhance partnership, communication, and advocacy.¹⁶ Taking a multimodal approach, the Plan intends to implement greater goods movement and logistics planning coordination between sectors, municipalities and levels of government.

Integrating land-use and transportation planning also requires balancing a number of interests and priorities, including those related to long-term fiscal sustainability, economic growth and performance, environmental sustainability and climate resiliency, public safety, public health and equity. For instance, environmental protections might be seen as an impediment to growth. There can be a tension between



growth and public safety, where development initiatives could alter response times for emergency services. Prioritizing pedestrian and cycling infrastructures can impede last-mile delivery of goods to people and businesses.

Equity

Transportation equity refers to the distribution of costs and benefits of mobility and accessibility geographically and across socio-economic conditions and demographics.¹⁷ Transportation planning decisions mainly affect individuals' economic and social opportunities through distribution of transportation supply.¹⁸

For instance, transportation provides accessibility to many amenities, such as health care facilities, schools, grocery stores, and jobs. In a 2018 research study of the Montréal, Toronto and Vancouver regions, accessibility to employment appears to be greater along rapid transit lines, particularly around transit stations, and increasingly diminishes further away from the central business district, demonstrating the importance of compact communities in proximity to rapid transit.¹⁹ The same study concludes that the size of the city does not seem to predict accessibility levels. Instead, it is land-use patterns, the characteristics of transportation systems (e.g., speed, frequency and coverage), and the geography of an urban centre that explains variations in accessibility.

Similarly, housing affordability appears to be impacted based on the proximity to a city centre and public transit, which can have equity implications. A significant body of evidence points toward an increase, on average, in land values around rapid transit corridors.²⁰ However, trade-offs between location affordability and commuting costs are complicated. In the Vancouver region, some transportation costs appear to be absorbed by living close to frequent transit.²¹ In the Toronto region, while homes become increasingly more affordable further away

from the centre, commuting costs in some suburbs makes it less affordable than living closer to the centre. Trade-offs between transportation and housing costs tend to be context-specific and vary based on the urban centre itself.

Assessing and evaluating equity impacts is complex. Equity can be addressed through various approaches for which there are trade-offs between efficiency and equity objectives.²² Planners and policy makers have the difficult task to balance those objectives and measure the impacts of transportation projects against a number of equity considerations.

TRENDS

Planners and policy makers must grapple with current trends, including the growing demand for affordable housing and transportation, the rise of e-commerce, the increase in trade, and the uncertain potential of automated and connected vehicles (AV/CVs).

The persistent sprawl of single-family homes and development farther and farther away from job centres, and its related policy challenges for governments, has created an appetite to limit low-density, single-family housing development. For instance, there are examples in the U.S. where exclusive single-family zoning has essentially been eliminated. Minneapolis, Minnesota, was the first city to end single-family zoning at the municipal level in December 2018, followed by Seattle, Washington, in March 2019, in 27 of its neighborhoods. In July 2019, the state of Oregon has moved forward with a similar initiative to allow for apartments to be built on land that was previously reserved for single-family houses. Impacts to current single-family home owners and buyers, housing prices, and development is yet to be determined. For transportation, if this policy were to increase density, it may affect the cost-efficiency of the delivery of public transportation in these affected areas.



The advent and proliferation of new business models based on same day consumer goods delivery creates additional challenges for the transportation of goods to and from cities, but also within cities. E-commerce has been growing steadily in Canada and is expected to represent a growing portion of retail sales in the future.²³ Online purchases are particularly popular in urban areas. According to Canada Post, in 2018, 45 per cent of the e-purchases made in Canada originated from urban households, as opposed to 36 per cent for suburban and 19 per cent for rural households.²⁴ In addition, rising expectations of Canadians related to the speed of delivery, whether paid or free,²⁵ may in turn increase expectations of businesses in regard to the state and performance of transportation networks. These trends could see the proliferation of networks of distribution centres in and around urban centres for last-mile delivery, preferably with multimodal connections. This means that land-use and transportation planning will have to accommodate this potential demand in capacity.

The value of Canada's international trade has increased, with the total value of trade in goods and services reaching a record high of \$1.5 trillion, or 66 per cent GDP in 2018. Canada's goods exports continued to grow in 2018, with export volumes increasing by 4.1 per cent and import volumes increasing by 3.3 per cent.²⁶ Infrastructure investments are being made to accommodate this growth, with federal and provincial governments recognizing the importance of infrastructure to the economy. However, continued strategic investment in transportation is essential to maintain Canada's competitiveness, as continued growth in trade will increase pressure along specific corridors and key Canadian ports.

Land-use patterns are heavily influenced by certain travel modes and the behaviour of

their users. New technologies may have an impact on these patterns, in particular AV/CVs.ⁱ As these vehicles are not yet available to the public, planners and policy makers rely on simulation and modelling rather than real-world data to assess their potential impacts. A 2019 review of 37 modelling studies conducted in the U.S., Europe, Asia and Australia shows the potential long-term effect of AV/CVs on location choice of households and businesses.²⁷ Most of these studies point toward an increase in sprawl into accessible, distant suburban and rural areas, particularly when private ownership of AV/CVs is assumed. According to this review, when the sharing of AV/CVs is assumed, combined with efficient, automated public transportation, AV/CVs could encourage compact urban communities. In addition, depending on the level of ownership and sharing of AV/CVs, parking areas and road space could be freed up and be repurposed for other productive uses, while potentially decreasing some revenue for municipalities. Caution must be exercised when looking at these results, as they are based on assumptions that may not be realized, or may be realized differently. However, they point towards interesting implications that AV/CVs may have on the land use / transportation interface.

OPPORTUNITIES

Governments have the opportunity to further integrate land use and transportation in urban regions by exploring the benefits and feasibility of transit-oriented development, transport demand management and the development of comprehensive planning models.

Transit-oriented development

Transit-oriented development (TOD) is a form of planning to promote higher density,

ⁱ The potential impacts and opportunities related to AV/CVs are explored further in the Technology & Innovation Primer.



mixed-use, and walking- and cycling- friendly areas around and/or integrated with transit stops and stations. Translink, the regional transit and transportation authority for Metro Vancouver, describes TOD areas as having six major attributes: 1) they are aligned with major urban destinations; 2) they are easily accessible by walking and the distance to get to a transit stop is proportional to the capacity of the transit service; 3) their design invites walking and cycling, and they are safe and comfortable; 4) their density within walking distance is high enough to encourage sufficient demand for transit services; 5) they have a high degree of mixed land use, making them more likely to meet the needs of residents within walking or cycling distance; and 6) they discourage unnecessary driving through transportation demand management initiatives.²⁸

Potential benefits of TOD include reduced car dependency, greater adoption of active modes of transportation, higher density levels, increased transit ridership and associated transit revenue, greater return on investment for transit infrastructure and enhanced user experience.²⁹ Research is also showing that public transportation investments can have the potential to promote compact developments, which, in turn, provide a host of environmental and social benefits, including reducing vehicle kilometres travelled, fuel use, and GHG emissions.³⁰ TOD also involves certain challenges and risks. There is a need for greater collaboration between provincial and municipal governments, public transportation agencies, amongst municipalities, land developers and the public to ensure optimal implementation. Depending on the degree of public involvement, TOD may also require a greater reliance on the private sector, which is subject to the conditions of the real estate market, to help develop those areas, and potentially build public transit facilities in exchange for development rights. A recent example of this approach can be found in the government of Ontario's plans to replace the existing Mimico GO station. In exchange for the right to build a development

above/integrated with the new station, a developer will pay some costs associated with the construction of the station, new underground parking, and improved connections to the local community (note: each TOD agreement is unique insofar as how much the transit capital costs the developer takes on).

A 2019 study by the American Public Transportation Association shows that the private sector recognizes the benefits of developing around transit stops and stations due to increased values of homes and offices.³¹ Permitting different uses of the space around and above transit hubs, for example, and lifting regulatory burdens, such as zoning-laws, could be key to enabling the kind of density and mixed use (commercial and residential) of real estate that underpins TOD. This presents governments with the opportunity to leverage this market interest to advance supportive land-use patterns and achieve urban transportation objectives.

Transportation demand management

Transportation demand management (TDM) is a set of measures and strategies designed to influence travel behaviours with the goal of improving the efficient use of transportation systems without altering their existing capacity.³² TDM influences whether, why, when, where and how people and freight travel,³³ and it is now common in a number of transportation, regional, and community plans across Canada. For example, the Port of Vancouver has seen success in alleviating drayage truck congestion, through an action plan. A common issue faced by Canada's containerized cargo shippers are drayage trucks that miss scheduled appointments for pick ups and drop offs of containers at marine and rail terminals due to unplanned congestion and delays on public road networks. This issue is acute at the Port of Vancouver where marine terminals are situated in densely populated areas, and with facilities spread throughout the region. The



Port, the trucking community, and the terminal operators have promoted night time truck gates as an alternative, in order to take advantage of times where trade corridors are less congested with commuter traffic. The result is increased fluidity and reliability of the supply chain and reduced truck volumes on the roads during peak hours during the day.

Many TDM measures either require land use and transportation integration or have implications for land-use patterns. For instance, amending parking policy through capping street parking might require changes to zoning by-laws, and pricing street parking based on actual costs could increase the demand for higher density, transit-connected communities.³⁴ Similarly, introducing road pricing mechanisms (e.g., tolls or congestion charges) could encourage infill development. While TDM has the potential to reduce congestion, optimize infrastructure investments, and boost environmental and health outcomes, coordination between transportation planning and land-use planning is essential to ensure objectives are aligned and mutually beneficial.

Modernizing planning models

Governments also have the opportunity to develop even more comprehensive planning

models. These could call for enhanced collaboration within government (internally, between different agencies), across government and stakeholders (horizontally) and between levels of government and stakeholders (vertically). Maximizing investments and outcomes might mean considering an array of guiding principles related to equity, affordability, economic growth and performance, public health and environmental sustainability when making those decisions.

Urban goods movement should not be overlooked in community planning and development. Urban goods movement is essential to the competitiveness of Canada's economy and the quality of life of all Canadians. Integrated transportation planning should consider challenges that the goods movement industry is facing, including growing congestion, land-use conflicts between residential, commercial, and industrial land, last-mile connectivity and lack of coordination between the public and private sectors,³⁵ while also addressing its negative externalities, such as pollution, noise, and vibration. Ensuring that transportation systems work for both passengers and goods involves addressing current goods movement issues such as off-peak delivery, the growth in e-commerce and the potential of supply chain technologies.³⁶



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