Identifying Areas for Transit-Oriented Development in Vancouver Using GIS

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Background

Transit-oriented development (TOD) is emerging as a popular and influential planning idea across North American cities as a means of sustainable urban development. TOD is generally defined as moderate to high-density, mixed-use residential and commercial development located around a transit station or corridor. Representing the full integration of land use and transportation planning,[1] it encourages a compact and pedestrian-oriented form that provides enhanced access to residential, retail, office, and community uses nearby. This encourages less automobile dependency and reduces GHG emissions. Given current concerns of urban sprawl and high ecological footprints, pursuing TOD has proven to be an effective way of concentrating growth for energy-efficient urbanism while generating and attracting transit ridership to shift mode share.[2]

Case Study

In the city of Vancouver, the SkyTrain rapid transit system has shaped land use planning since its inception in 1985. While development that capitalizes on rapid transit has been successful in the downtown core, stations beyond the peninsula have yet to pursue TOD to its full potential. Given the projected population increase from about 578,000 in 2006 to 740,000 by 2041, identifying areas for TOD is becoming increasingly important for long-term planning. Transit corridors are an immediate opportunity to concentrate future growth to create complete neighbourhoods and contribute to attaining multi-scalar GHG reduction and mode share targets:

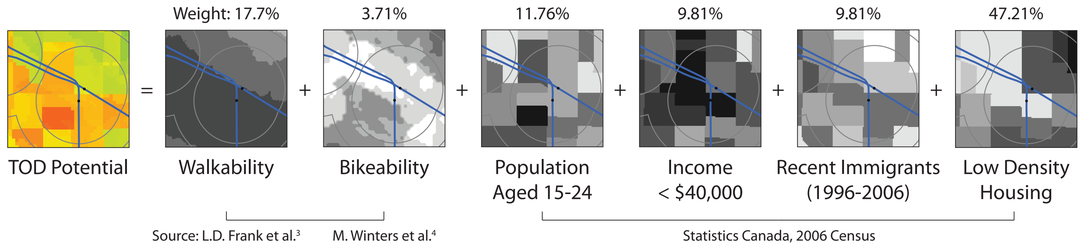
- Provincial: 2007 BC Greenhouse Gas Reductions Target Act;
- Regional: 2011 Regional Growth Strategy; and
- City: 1997 Transportation Plan, Greenest City 2020 Action Plan.

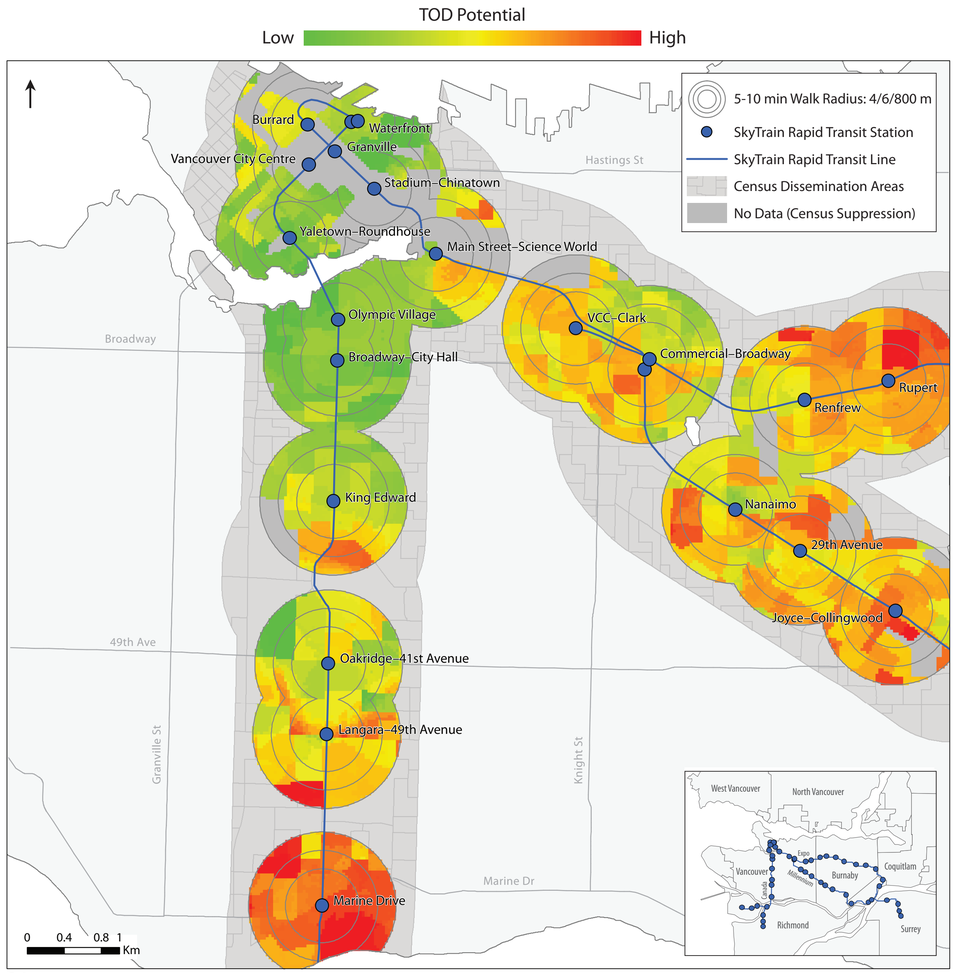
Methods

Using a Geographic Information System (GIS), a multi-criteria evaluation (MCE) was conducted to assess TOD performance in Vancouver and identify stations that would benefit from intensifying and optimizing TOD. ESRI ArcGIS 10 was used to conduct the MCE with the Weighted Sum tool. Criteria layers were converted to raster format at 10 m resolution and standardized to a scale of one to 10, where one had the least potential for TOD and 10 had the most potential. Weights were then generated using pairwise comparisons.

High proportions of youth, recent immigrants, lower income households, and low proportions of low density housing are imagined to be found in an ideal TOD. Therefore, areas that presently have a higher proportion of these criteria indicate higher potential for TOD. Because TOD is intended to promote walking, biking, and transit use, it is important to ensure that these types of transformations will increase the walkability and bikeability of communities along transit corridors. Thus, a high score of 10 for TOD potential indicated presently low walkability/bikeability levels, and vice versa.

Weighted Multi-Criteria Evaluation: Potential for TOD Intensification





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Discussion

Ten stations that have moderate to high potential for TOD intensification are identified:

- Expo Line: Commercial-Broadway, Nanaimo, 29th Av, Joyce-Collingwood;
- Millennium Line: VCC-Clark, Renfrew, Rupert; and
- Canada Line: Oakridge-41st Av, Langara-49th Av, Marine Dr.

Density is a contentious topic in Vancouver, earmarked by neighbourhood opposition and discussions over housing affordability, gentrification, and neighbourhood character. These types of high-density developments are especially met with apprehension by the communities directly affected by such transformations. Using evidence-based planning rationale in creating successful TODs will serve as useful precedents to deepen public acceptance of more sustainable urban forms, especially given that concerns regarding neighbourhood character preservation often run high in traditional single-family districts.

Notwithstanding, these types of transformations will need to acknowledge geographic circumstance and contingency. New development will inevitably take on different forms through a consideration of context and desired planning outcomes. There is no single formula for achieving ideal TOD. Hence, the selected criteria aimed to capture social and physical dimensions of an ideal TOD. Planning decisions should be guided by sound land use, transportation, energy, and design rationale; and alignment with environmental, economic, and social sustainability principles.

Conclusion

GIS are a useful and powerful tool in guiding planning and policy decisions shaping long-term land use, transportation, and energy use. The results provide a useful visualization and quantitative assessment for city planners, politicians, and the public, and serve as validation in principle of past and current planning initiatives. Implementing a public participation GIS using methods like MCE to consider other criteria and different weighting schemes can improve the public process by enhancing planning literacy and engagement efforts. Offering transparency in analyses conducted by local governments may lend support from the public and assist in evidence-based decision-making for sustainability and climate change planning.

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