Envisioning Opportunities in Multimodal Transportation Planning

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Setting the Context

Over the last few decades, transportation planning has transformed into an increasingly multidisciplinary, holistic practice. Among the common disciplines, transportation planning is (rightfully) a major element of politics, technological innovations, the economy, the environment, community, and health.

In the last few elections, all major Canadian political campaigns involved a promise to citizens of improved public transportation services and infrastructure. Moreover, some of the greatest technological innovations of our generation is focused on the complete automation of transportation and mobility. Noticeably, communities that facilitate sustainable, active transportation and provide services in near proximity inherently have improved community cohesion and mobility (Hatzopoulou & Widener, 2016). It is evident that a shift in priorities has rendered transportation planning to be of increased relevance to all demographics and opportunities for major contributions to the field are imminent.

The Greater Toronto and Hamilton Area (GTHA)

Developments and innovation in transportation planning have mitigated barriers due to geographical distances. Today, most large North American markets (i.e. Detroit, Boston, Montreal, New York City, Chicago, Atlanta, etc.) are located within a 48-hour drive of the Greater Toronto and Hamilton Area (GTHA). The GTHA is also home to ten major airports, of which the largest, Toronto Pearson International Airport, attracts over 4 million enplaned and deplaned passengers each year (Greater Toronto Airports Authority, 2017).

While we are making breakthroughs in transportation technology, there are simultaneous challenges associated with substantial increases in population within urban metropolises. Today, the GTHA has a total population exceeding 7 million residents, and is forecasting a population that exceeds 10 million by 2041 (Region of Peel, 2012). This increase in population translates into an estimated 49% increased travel time from a current 82-minute regional average to 122 minutes. Similarly, the induced travel demand will pose an additional estimated $14 billion in indirect costs to the GTHA from traffic congestion. These figures do not include the imposition on the environment, whose negative effects generally transcend monetary values.

What does this all mean? In simple terms, while in the GTHA we can travel further distances, traffic congestion and increased travel times will continue to be a growing problem. Can we completely eliminate congestion? Most experts seem to believe that congestion is inevitable (Hume, 2017). That belief however, cannot translate into a do-nothing, business as usual attitude. Traffic congestion follows an exponential pattern; higher traffic volumes result in exponentially higher travel times (Stevanovic, So, & Peter, 2015). If no courses of action are taken, then congestion will get exponentially worse; this is a precursor to increased wasted fuel, greenhouse gas emissions and time spent commuting. Fortunately, the exponential relationship between traffic volume and travel times works in the opposite direction; a small decrease in traffic congestion can facilitate significantly reduced travel time on the network.

A Multi-Modal Approach to Transportation Planning

The efficient movement of goods across regions and federal borders facilitates economic vitality and is similarly affected by congestion. The task that the GTHA is faced with involves delivering solutions maintain an acceptable level of service for the movement of both people and goods. However, with road capacity enhancements being finite, the challenge is to find effective ways to make a shift from driving to sustainable modes of travel, such as taking transit, carpooling, walking or cycling. Approximately two

thirds of the trips within the GTHA are made by single occupant vehicles (University of Toronto, 2012); therefore, a paradigm shift towards sustainable modes is not only necessary, but also plausible.

In order to mitigate the negative perceptions and impacts of private cars, our next generation will have to be creative in deploying solutions that are truly multimodal in nature. Within this context, there are multiple approaches that present noteworthy opportunity for optimizing transportation infrastructure resources.

For example, looking at the big picture, understanding travel behaviour and why and when people choose to make trips is essential to community design and planning. A successful interpretation of travel behaviour can enable planners to build communities that facilitate the majority of sought out services (i.e. entertainment, shopping, employment, daycare, etc.) within close proximity to each resident. There are also opportunities to enact the flexibility in employment which enables people to work during alternate hours or from a location closer than the office (e.g. home).

More specifically, the use of technology and intelligent transportation systems presents creative solutions to classical challenges. For example, one idea involves the use of simple artificial intelligence (e.g. neural networks, reinforcement learning, etc.) to optimize the flow of ramps on major freeways using meters. The same tools can be used to construct reliable headways between transit vehicles, adjust transit signal priority or provide reliable departure times to make transit modes more attractive.

A Future of Opportunities

Transportation planning is a process that has the potential to support and improve quality of life. By envisioning transportation planning as an embedded process within community planning, we are better able to develop complete and sustainable communities, create an integrative, efficient and safer transportation network, provide more transportation options (i.e. mode and route choices), support economic vitality, develop a healthier lifestyle and improve quality of life for all residents.

The Greater Toronto and Hamilton Area is a representative sample of what is to be expected across North American cities. Urban metropolises are expecting an immense increase in population, which translates into increased congestion and externalities, especially during peak hours. Our future must consist of innovative, multimodal solutions that are feasible economically, socially, and environmentally. This is why an unprecedented level of collaboration between different agencies, governments and professionals, both transportation and non-transportation alike, are going to be come essential.

Our challenges in transportation planning are great, but our opportunities to effect change are equally inordinate. As an aspiring urban transportation engineer, I am excited about the different opportunities for creativity and innovation that this career field is intended to bring.